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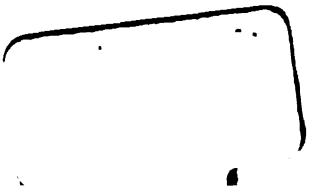

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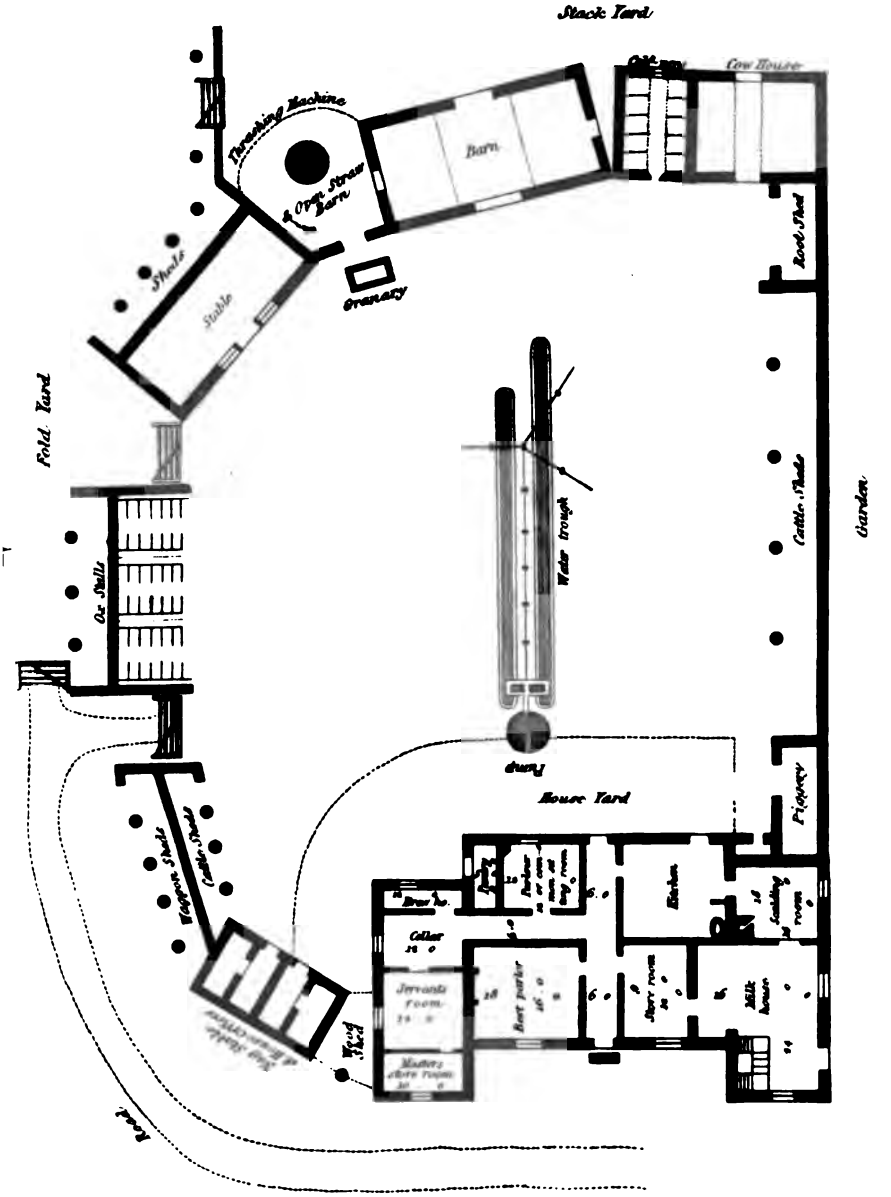

For the Complete Grazier, published December 10 1820 by Baldwin & Cradock, London.

THE

COMPLETE GRAZIER;

OR

FARMER'S AND CATTLE BREEDER'S AND DEALER'S ASSISTANT.

COMPRISING

Instructions for the Buying, Breeding, Rearing, and Fattening of Cattle; and the Stable Management of Horses.

Directions for the Choice of the best Breeds of Live Stock.

The Treatment of their Diseases, and the Management of Cows and Ewes during the critical Times of Calving and Yeaning.

The general Economy of a Grass Farm.

The Irrigation of Meadows, and the Preparation and Application of Manures.

The Culture, and Comparisons of the relative Value, of the best natural and artificial Grasses and Plants for Fodder.

Various Methods of cutting, mixing, and preparing Food in severe Winters and Seasons of Scarcity.

The Economy and general Management of the Dairy, including the Making, Curing, and Preservation of Butter and Cheese; with the most approved Methods of feeding Pigs.

TOGETHER

WITH AN INTRODUCTORY VIEW

OF THE DIFFERENT BREEDS OF

NEAT CATTLE, SHEEP, HORSES, AND SWINE:

THE

PRESENT STATE OF THE WOOL TRADE,

AND THE IMPROVEMENT OF BRITISH WOOL.

ALSO,

AN APPENDIX,

ON

PRIZE CATTLE, FARM ACCOUNTS, AND OTHER SUBJECTS CONNECTED WITH AGRICULTURE.

BY A LINCOLNSHIRE GRAZIER:

ASSISTED BY COMMUNICATIONS FROM SEVERAL YORKSHIRE, LEICESTER, AND NORFOLK FARMERS.

Fifth Edition,

REVISED, CORRECTED, ENLARGED, AND GREATLY IMPROVED.

ILLUSTRATED BY NUMEROUS ENGRAVINGS.

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TO THE

NOBLEMEN, GENTLEMEN, AND FARMERS,

COMPOSING THE

SMITHFIELD CATTLE-CLUB,

TO WHOSE EXERTIONS THE PUBLIC IS SO MANIFESTLY INDEBTED FOR MANY

VALUABLE IMPROVEMENTS IN THE LIVE STOCK OF THE COUNTRY,

This Work

IS RESPECTFULLY DEDICATED

BY THEIR MOST OBEDIENT SERVANT,

AND FELLOW-MEMBER,

THE EDITOR.

PREFACE

TO THE FIRST EDITION.

AMONG the various publications which, of late years, have issued from the press on different subjects of rural economy, none has hitherto appeared on that department which is here more particularly treated upon. With a view to supply such deficiency, the present work was undertaken; in which it is attempted to concentrate every important fact connected with the rearing, breeding, feeding, fattening, and diseases of Cattle, (so far at least as the present imperfect state of veterinary medicine will allow,) as well as on the general economy of a Grass-farm. Such as it is, the editor now submits the result of his labours—founded partly on personal knowledge, and, where that was deficient, on the experience of others—to the candour of a British Public: conscious that, though it be not faultless, he has sedulously avoided the introduction of speculative opinions, or of undue assertions, while no efforts have been omitted to render the present work a useful compendium of facts, connected with the peculiar branch of rural economy which is therein discussed.

ADVERTISEMENT

TO THE FIFTH EDITION.

THE very favourable reception given to the Four former impressions of this Work, demands the Editor's warmest acknowledgments; and since the rapid sale of those editions has rendered a *fifth* necessary, he deems it his duty to say, that no exertions have been spared, to make the present work deserving of the liberal patronage it has received, by incorporating every material fact and improvement that has recently occurred. The whole Work has undergone a most careful revision; and in addition to the various new information introduced in almost every page, the Editor has now given numerous interesting particulars, of considerable moment to the Farming Public; to whom, it is hoped, this Work will prove not less acceptable in its present improved state.

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Page 72, line 28, for "Chapter II. Section 4." read "Chapter I."
Pages 81, 84, 99, and 178, Notes, for "Book XI." read "Book IX."
Page 89, line 7, for "Book XI." read "Book IX."
Page 112, Note, for "Books X. and XI." read "Books VIII. and IX."
Page 145, line 28, delete "and".
Page 179, Note, for "Book XII. Chapter II. Section 1." read "Book X. Chapter VII."
Page 274, line 35, for "quantity" read "quality".
Page 299, Note *, for "Chapter IX." read "Chapter VII."
Ibid. Note †, for "Section 6." read "Section 7."
Page 423, last line, for "already" read "hereafter".

BOOK THE FIRST.

ON THE BREEDING, REARING, FATTENING, AND GENERAL MANAGEMENT OF NEAT CATTLE.

THE

COMPLETE GRAZIER,

ETC.

BOOK THE FIRST.

CHAPTER I.

INTRODUCTORY VIEW OF THE DIFFERENT BREEDS OF NEAT CATTLE IN GREAT BRITAIN.

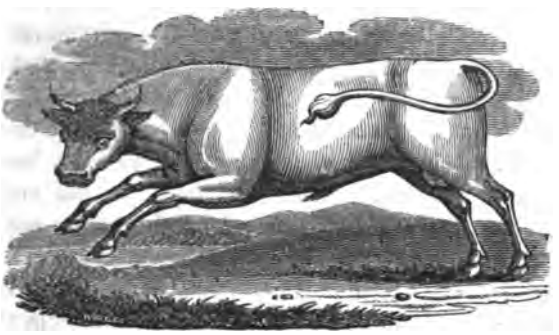
Of the various sources which compose the wealth of nations, there are few, perhaps, of greater moment, or which have a superior claim to attention, than that branch of rural economy which is the subject of the following pages. In fact, when it is considered, that not only the servants of a farmer, but also his cattle, are *productive* labourers; when we recollect the stimulus to industry, as well as the rapid circulation of capital which the farmer occasions, by furnishing constant employment to the numerous artificers, who are occupied in manufacturing implements which are indispensably necessary to him; further, when

we call to mind the immense mass of materials which his *productive* labour supplies for the purposes of commercial intercourse, and especially the influence produced by that labour on the comfort and appearance of towns, whose inhabitants must otherwise be destitute of the necessaries of life; when all these diversified circumstances are taken into consideration, every reflecting inquirer must acknowledge, that of all the ways in which a capital can be employed, this is by far the most advantageous to society.

Justly, therefore, has it been remarked *, that "the capital employed in agriculture not only puts into motion a greater quantity of productive labour than any equal capital employed in manufactures, but, also in proportion to the quantity of productive labour which it employs, it adds a much greater value to the annual produce of the land and labour of the country, while it increases the real wealth and revenue of its inhabitants."

Many circumstances have long concurred to render live stock an object of the utmost importance to the farmer; and notwithstanding the great advances made in other branches of husbandry, none has undergone a greater change of system, or has received more manifest improvement, than the breeding, rearing, and management of cattle. Independently of the stimulus afforded, during the late war, to the exertions of the mere grazier by the rapid increase in the price of all the necessaries of life, the influence of the many societies established of late years for the encouragement of agriculture has powerfully tended to promote enquiry, and to disseminate information on this interesting subject; while the patronage and example of several public spirited noblemen and gentlemen of high rank, have diffused a taste for the pursuits of rural economy, that has had a most beneficial effect on the general prosperity of the country. Among these, none have attracted more attention than those which are discussed in the following pages; and, although the main object is to convey instruction on the points more immediately applicable to the business of the Grazier, it is yet presumed that a concise outline of the principal breeds, and varieties of breeds of cattle found in this highly cultivated island, cannot prove unacceptable to every class of farmer.

* Smith's Wealth of Nations, Vol. II. p. 53. Fourth edition.



I. The WILD CATTLE—of a bull, of which race the above is a portrait,—were the original stock of the kingdom, before enclosures were known. They are said to be still found at Chartley Park, in Derbyshire, and, perhaps, in one or two more; but it is believed, that the only pure breed is that preserved, in a wild state, at Chillingham Castle, in Northumberland, the seat of the Earl of Tankerville, whose steward, Mr. Bailey, thus describes them *:—

"Their colour is invariably white; muzzle black; the whole of the inside of the ear, and about one-third of the outside, from the tip downwards, red; horns white, with black tips, very fine, and bent upwards. Some of the bulls have a thin upright mane, about an inch and a-half or two inches long: the weight of the oxen is from thirty-five to forty-five stone, of fourteen pounds; and that of the cows, from twenty-five to thirty-five stone the four quarters. The beef is finely marbled, and of excellent flavour.

"From the nature of their pasture, and the frequent agitation they are put into, by the curiosity of strangers, it cannot be expected they should get very fat; yet the six years' old oxen are generally very good beef; from whence it may be fairly supposed that, in proper situations, they would feed well.

"At the first appearance of any person they set off at full speed, and gallop to a considerable distance; when they wheel round, and come boldly up again, tossing their heads in a menacing manner: on a sudden they make a full stop, at the distance of forty or fifty yards, looking wildly at the object of their surprise, but upon the least motion being made, they again turn

* Agricultural Survey of Northumberland, Third Edition, p. 141.

round, and gallop off with equal speed; forming, however, a shorter circle, and returning with a bolder and more threatening aspect, they approach much nearer, when they make another stand, and again gallop off. This they do several times, shortening their distance, and advancing nearer till they come within a few yards, when most people think it prudent to leave them.

"The mode of killing them was, perhaps, the only modern remains of the grandeur of ancient hunting. On notice being given that a wild bull would be killed upon a certain day, the inhabitants of the neighbourhood came in great numbers, both horse and foot; the horsemen rode off the bull from the rest of the herd until he stood at bay, when a marksman dismounted and shot. At some of these huntings, twenty or thirty shots have been fired before he was subdued: on such occasions, the bleeding victim grew desperately furious from the smarting of his wounds and the shouts of savage joy that were echoing on every side. From the number of accidents that happened, this dangerous mode has been seldom practised of late years; the park-keeper alone generally shooting them with a rifled gun at one shot.

"When the cows calve, they hide their calves for a week or ten days in some sequestered situation, and go and suckle them two or three times a-day. If any person come near the calves, they clap their heads close to the ground, and lie like a hare in a form, to hide themselves. This is a proof of their native wildness, and is corroborated by the following circumstance, that happened to the writer of the narrative, who found a hidden calf, two days old, very lean, and very weak; on stroking its head, it got up, pawed two or three times like an old bull, bellowed very loud, retired a few steps, and bolted at his legs with all its force; it then began to paw again, bellowed, stepped back, and bolted as before; but knowing its intention, and stepping aside, it missed him, fell, and was so very weak that it could not rise, though it made several efforts; but it had done enough; the whole herd were alarmed, and, coming to its rescue, obliged him to retire; for the dams will allow no person to touch their calves without attacking them with impetuous ferocity.

"When any one happens to be wounded, or grown weak or feeble through age or sickness, the rest of the herd set upon it, and gore it to death."

II. The DEVONSHIRE BREED, delineated above, is supposed to have descended directly from the wild race. It is found in its purest state in North Devon; in the agricultural report of which district its peculiar qualities are thus described by the late Mr. Vancouver:—

"Its head is small, clean, and free from flesh about the jaws; deer-like, light and airy in its countenance; neck long and thin; throat free from jowl or dewlap; nose and round its eyes of a dark orange colour; ears thin and pointed, tinged on their inside with the same colour that is always found to encircle its eyes; horns thin, and fine to their roots, of a cream colour, tipped with black *, growing with a regular curve upwards, and rather springing from each other; light in the withers, resting on a shoulder a little retiring and spreading, and so rounded below as to sink all appearance of its pinion in the body of the animal; open bosom, with a deep chest, or keel; small and tapering below the knee, fine at and above the joint, and where the arm begins to increase, it becomes suddenly lost in the shoulder; line of the back straight from the withers to the rump, lying completely on a level with the pin, or huckles, which lie wide and open; the hind quarters seated high with flesh, leaving a fine hair-ham tapering from the hock to the fetlock; long from rump to huckle, and from the pinion of the shoulder

* The late Rev. Arthur Young, formerly secretary to the Board of Agriculture, describes thorough bred Devons as of a bright red, neck and head small, eye prominent, and round it a ring of bright yellow; the nose round the nostril having the same colour; the horn clear and transparent, upright, tapering, and gently curved, but *not* tipped with black.—*See Agricultural Survey of Sussex, p.* 248.

to the end of the nose; thin loose skin, covered with hair of a soft and furry nature, inclined to curl whenever the animal is in good condition and in full coat, when it also becomes mottled with darker shades of its permanent colour, which is that of a bright blood red, without white, or other spots, particularly on the male; a white udder is sometimes passed over, but seldom without objection.

"This description may be considered as a summary of the perfections as to the exterior appearance of the animal: what, under the same head, may be regarded as defects, appear first in the sudden retiring of the vamp from behind the huckle to a narrow point backwards; the great space between the huckle and first rib; the smallness of the angle inwards at which the ribs appear to be projected from the spine or back-bone, often giving the appearance of a flat-sided animal, and in its being so much tucked up in the girth as to show an awkward cavity between the keel and navel, the line of which, it is presumed, should always be found to hold a position as nearly as possible parallel with that of the back from the withers to the loin. The animal is, however, generally well grown, and filled up behind the shoulder.

III. The SUSSEX BREED differs but little from the Devonshire: when pure, the cattle are invariably dark red; and those which are marked with a mixture of either white or black, although passing under the denomination of *Sussex*, are always crossed with foreign blood. In other respects they are thus described by an eminent breeder*, the accuracy of whose judgement has been confirmed by many intelligent graziers.

* Mr. Ellman, of Glynde. See Agricultural Survey of Sussex, p. 231.

"A thin head, and clean jaw; the horns pointing forward a little, and then turning upward, thin, tapering, and long; the eye large and full; the throat clean, no dew-lap; long and thin in the neck; wide and deep in the shoulders; no projection in the point of the shoulder, when looked at from behind; the fore-legs wide; round and straight in the barrel, and free from a rising back-bone; no hanging heaviness in the belly; wide across the loin; the space between the hip-bone and the first rib very small; the hip-bone not to rise high, but to be large and wide; the loin, and space between the hips, to be flat and wide, but the fore part of the carcass round; long and straight in the rump, and wide in the tip; the tail to lay low, for the flesh to swell above it; the legs not too long; neither thick nor thin on the thigh; the leg thin; shut well in the twist; no fulness in the outside of the thigh, but all of it within; a squareness behind, common in all long-horned beasts, greatly objected to; the finer and thinner in the tail the better.

"Of these points, the Sussex beasts are apt to be more deficient in the shoulder than in any other part. A well made ox stands straight, and nearly perpendicularly, on small clean legs; a large bony leg is a very bad point, but the legs moving freely, rather under the body than as if attached to the sides; the horns pushing a little forward, spreading moderately, and turning up once. The horn of the Devonshire, which very much resembles the Sussex, but smaller and lighter, is longer, and rises generally higher. The straightness of the back line is sometimes broken, in very fine beasts, by a lump between the hips."

On a comparison between the Devon and Sussex breeds, the former has been considered by competent judges as thinner, narrower, and sharper than the latter, on the top of the shoulder or blade bone; the point of the shoulder generally projects more, and they usually stand narrower in the chest; their chine is thinner, and flatter in the barrel, and they hang more in the flank; but they are wider in the hips, and cleaner in the neck, head, and horns, and smaller in the bone, than the Sussex; their hides are thinner and softer, and they handle as mellow. The distinction between them, however, is not very striking; they are equally profitable to the grazier, and, as working cattle, they both stand unrivalled *.

* See the Agricultural Survey of Sussex, p. 238.

IV. The HEREFORD BREED is a variety of the Devon and Sussex, but is larger and weightier than either; being generally wider and fuller over the shoulders or chine, and the breast, or brisket, as well as in the after part of the rump. The prevailing colour a reddish brown, with white faces; the hair fine, and the skin thin.

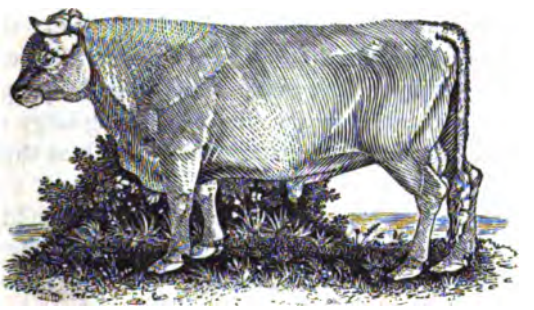
In the true bred Hereford cattle there is no projecting bone in the point of the shoulder, which in some breeds forms almost a shelf, against which the collar rests; but on the contrary tapers off: they have a great breadth before, and are equally weighty in their hind quarters; the tail not set on high; a great distance from the point of the rump to the hip bone; the twist full, broad, and soft; the thigh of the fore legs to the pastern joint tapering and full, not thin, but thin below the joint; the horn pushes aside a little, and then turns up thin and tapering; remarkably well feeling; mellow on the rump, ribs, and hip bone. The quality of the meat not hard, but fine as well as fat; little coarse flesh about them, the offal and bone being small in proportion to their weight; whilst their disposition to fatten is equal, or nearly so, to that of any other breed in the island*. They are, however, ill calculated for the dairy; their constitutional disposition to accumulate flesh being in opposition to the qualities of good milking cows,—an observation which will equally apply to every breed, when similarly constituted. A breed of cattle, equally adapted to the shambles, the dairy, and the plough, is indeed not to be met with; and experience teaches that these properties are inconsistent with each other. The Hereford cattle are by many good judges considered to ap-

* See the Agricultural Survey of Sussex, p. 249.

proach the nearest to that perfect state of any of the large breeds: they arrive early at maturity, and are fit for labour; but it is as fatting stock that they excel, and it is a different variety of the same breed that is preferred for the dairy. There is, indeed, a more extraordinary disproportion between the weight of Herefordshire cows, and that of the oxen bred from them, than is to be found in any other of the superior breeds: they are comparatively small, extremely delicate, and light-fleshed; and it is said that they are not unfrequently the mothers of oxen, nearly three times their own weight *.

On comparison with the Devon and Sussex, the Hereford breed will probably not be found equally active and hardy in the yoke; but it is generally considered to exceed them in the quality of fattening †; and when compared with any other breed, it may fairly rank at least among the very best in the united kingdom.

The animal delineated on the preceding page was a prize ox, of the breed belonging to that spirited grazier, Mr. Westcar.



V. The SHORT HORNED CATTLE, under which denomination are indiscriminately included the *Dutch*, *Holderness*, and *Tees-water breeds*, are supposed to have acquired the appellation of Dutch, from a cross with some large bulls that were imported, near a century ago, from Holland into Yorkshire, in the east and north ridings of which county the two latter had been long established. It has, however, been doubted whether any ad-

* See the Agricultural Survey of Herefordshire, p. 118, and a Paper by T. A. Knight, Esq., in Communications to the Board of Agriculture, Vol. II.

† See Chapter II.

vantage was derived from this intermixture; for the increase thus obtained in size was thought to have been counterbalanced by a more than proportionate increase of offal. But, fortunately, the error was not universal; for some intelligent breeders aware, even at that day, of the superiority of symmetry to bulk, preserved the breed, of which they were already in possession, in its native purity; and it is from some of that stock, so maintained, that the present improved short horned cattle, now generally distinguished as the *Durham*, or *Yorkshire breed*, are descended.

This breed was introduced about forty years ago, by Messieurs Colling, of Darlington, and has rapidly risen in the public estimation. The cattle are very large, and are beautifully mottled with red or black upon a white ground; their backs level; throat clean; neck fine; carcass full and round; quarters long; hips and rumps even and wide: they stand rather high on their legs; handle very kindly; are light in their bone, in proportion to their size; and have a very fine coat, and thin hide*. They differ from the other breeds, not only in the shortness of their horns, but as being wider and thicker in their form, and consequently feeding to greater weight; in affording the greatest quantity of tallow when fatted; and in having very thin hides, with much less hair upon them than any other kind except the Alderneys†. They also possess the valuable properties of fattening kindly at an early age, and of yielding large quantities of milk; but the quality of the latter is not so rich as that of some other species.

Of this breed, Mr. Charles Colling, of Ketton, sold a bull—*Comet*—by public auction, in the year 1810, for the extraordinary sum of *one thousand guineas;* and the history of the celebrated *Durham ox*, the property of the same gentleman, is too remarkable not to merit attention.

He was bred in the year 1796, and at five years old was not only covered thick with fat upon all the principal points, but his whole carcass appeared to be loaded with it, and he was then thought so wonderful an animal, that he was purchased in February, 1801, for £140, to be exhibited as a show: his live weight being then 226 stone, of 14 pounds. In the following May he was again sold for £250, to Mr. John Day, who, two months afterwards, refused for him two thousand guineas! He

* See the Agricultural Survey of the West Riding of Yorkshire, page 248.

† See the Agricultural Survey of Northumberland, p. 139.

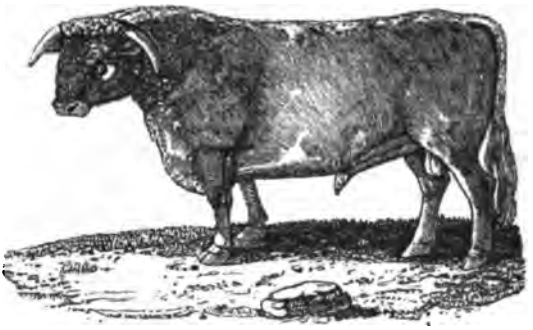
was exhibited in the principal parts of the kingdom until April, 1807, when he was killed, in consequence of having accidentally dislocated his hip in the previous February, and although he must have lost considerably in weight during his illness, besides the disadvantage of six years' travelling in a caravan, yet his carcass weighed 187 stone 12 pounds*; and Mr. Day stated his live weight at ten years old, to have been 270 stone.

Uncommon as this animal then was, he has, however, been since exceeded in size by a Yorkshire ox, bred by Mr. Dunhill, of Newton, near Doncaster, the carcass of which weighed, when killed, 264 stone 12 pounds; and he was supposed to have lost near forty stone while being exhibited in London.

Still more recently, another beast of uncommon size, fed by Lord Yarborough, has been exhibited under the title of "*the Lincolnshire Ox*;" but, though bred in that county, from a favourite cow belonging to Mr. Goulton, he was got by a descendant of Comet, out of Countess, also of the Durham breed. This extraordinary animal measured five feet six inches in height at the shoulders, eleven feet ten inches from the nose to the setting of the tail, eleven feet one inch in girth, and three feet three inches across the hips, shoulders, and middle of the back; the lowest point of his breast was only fourteen inches from the ground, and he stood one foot ten inches between the fore-legs; the girth of the fore-leg was nine inches.

The variety of this breed known as the YORKSHIRE POLLED Cattle, only differs from those already described, in being without horns; they are in considerable estimation among the London cow-keepers, as milkers, and at the same time maintain their flesh in a state nearly fit for the shambles.

	St.	lbs.	
* Viz. Four Quarters	165	12	See Agricultural Survey of Durham, p. 230; and Mr. Day's Descriptive Pamphlet.
Tallow . . .	11	12	
Hide . . .	10	2	
	187	12	



VI. The LONG-HORNED CATTLE are descended from a breed which had long been established in the Craven district, in Yorkshire; some cows of which race, and a Lancashire long-horned bull, of the kind delineated above, were brought, early in the last century, by a Mr. Webster, to Canley, in Warwickshire, where they produced a stock that soon became remarkable for its beauty.

Of this *Canley stock*, the late Mr. Robert Bakewell, of Dishley, in Leicestershire, procured some cows, which he crossed with a Northumberland bull *, and thus reared that celebrated race now so well known as the *Dishley breed*. They were long and fine in the horn, had small heads, clean throats, straight broad backs, wide quarters, and were light in their bellies and offal; and, probably from the effect of domestication and gentle treatment, remarkably docile: they grew fat upon a smaller proportion of food than the parent stock; but gave less milk than some other breeds; and the chief improvements effected seem to have been, in their aptitude to fatten early on the most valuable points, and in the superior quality of the flesh.

Notwithstanding the deservedly high reputation, as a breeder, enjoyed by Mr. Bakewell during his life, and which still attaches to his name, his judgment in selecting the long-horned cattle for his experiments has been called in question; and it has been asserted, "that had he adopted the *middle-horned breed*, either of Sussex, Devonshire, or Herefordshire, in preference to the inferior stock which the reputation of his name, and the mysterious

* See Agricultural Survey of Leicester, p. 218. Mr. Marshall says, "*a bull purchased in Westmoreland*"; but he does not state the breed. See his Rural Economy of the Midland Counties, Vol. I. p. 269.

manner in which his breeding system was conducted, have introduced, it would have contributed to exalt the superiority of his stock, beyond the power of local prejudices to remove."* The removal of local prejudice is not, however, an easy task, even when ill-founded, which it would be too much to assume in the present instance; for, whatever may be the merits of the long-horned cattle, comparatively with other breeds, it must be admitted, that they rank among the finest in the kingdom; and it is certain, that the perfection which they have attained in the hands of the eminent breeders of the present day, has been acquired through the medium of the Dishley blood.

With regard to the "mysterious manner," in which Mr. Bakewell has been too generally accused of having conducted his business, it is a charge so vague and undefined, as hardly to merit remark; yet, as it conveys somewhat of reflection upon his character, it may be due to his memory to enquire upon what foundation it rests? And if examined closely, it will resolve itself into this:—that he was gifted with more than common acuteness of observation, judgement, and perseverance; which, combined with the experience he had acquired under his father, (who was also a distinguished breeder in his time,) he unremittingly applied to the improvement of cattle. Such qualities, directed to any one object, could not fail of success; and such, it may be fairly presumed, were the only mysteries he employed. However it may be regretted that he has not left any record of his experiments, yet, as no man is bound to publish his transactions, his having omitted to do so cannot justly be made a ground of accusation.

The modern improvements made in the long-horned cattle, since the first attempts of Bakewell, are considered to consist chiefly in the coarser parts having been reduced, and the more valuable enlarged. The present breed is finer boned and finer in the neck, throat, and breast; the back is straight, wide, and well covered with flesh; the rump is also wide, and particularly fleshy on the points, and about the root of the tail. Even when only in store order, the flank feels thick and fleshy, and in every part the animal handles loose and mellow.

These, indeed, were always the distinguishing points of these

* The Rev. Arthur Young: Agricultural Survey of Sussex, p. 226.

cattle; but they were not thought attainable except they were fed on the richest pasture. This, however, has proved to be an error; for not only are they now found on land of no extraordinary quality, but it even appears to be generally admitted, that well bred cattle will do better on ordinary food than those of an inferior kind; it was indeed asserted by Bakewell, that this breed kept themselves in good condition on less food than any other of equal weight *, an opinion that seems to have been fully justified by the large prices that have been repeatedly given for the stock †.

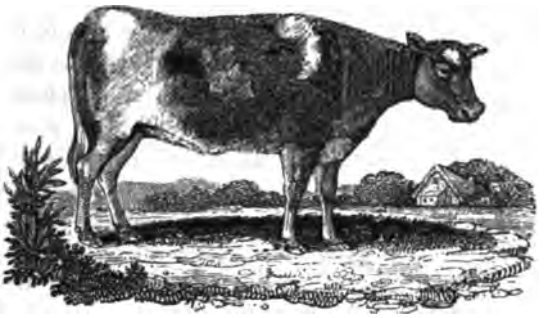
* See the Agricultural Survey of Leicestershire, p. 219, and Chap. II.

† At a sale of Mr. Fowler's stock (of this breed) at Little Rollright, in Oxfordshire, in 1791, fifteen head of oxen, five bulls and ten cows, were sold for various sums, amounting to 246*l.*, or upon an average, at 16*l.* each. The finest bull, named Sultan, only two years old, produced *two hundred and ten guineas;* and *Washington*, another of the same age, was sold for *two hundred and five guineas;* while *Brindled Beauty*, a cow, brought the sum of *two hundred and sixty guineas;* but, at a subsequent sale of stock belonging to Mr. Paget, in 1793, *Shakspeare*, a bull, bred by Mr. Fowler from a grandson of Mr. Bakewell's famous bull, Twopenny, and a cow of the Canley blood, was disposed of for *four hundred guineas.*

At a still later period, Mr. Princep, of Croxhall, in Derbyshire, is said to have refused 2000*l.* for twenty long-horned dairy cows, and 1500 guineas for the use of his best bull to thirty cows.

Large as these prices were, they have, however, been exceeded by those actually obtained for short-horned cattle. At the sale already alluded to, of Mr. Charles Colling's stock, at Ketton, in the county of Durham, in 1810, seventeen cows and eleven bulls produced 4918*l.*, being an average of 175*l.* 10*s.* each. Of these, two cows, *Countess and Lilly*, both got by Comet, were sold, the one for *four hundred*, and the other for *four hundred and ten guineas.* Petrarch, a bull, by Favourite, the sire of Comet, brought *three hundred and sixty-five guineas*, and Comet himself *one thousand!*

Still more recently, however, in February 1827, at a great sale of stock, the property of Mr. Rennie, of Phantassie, in East Lothian, (which amounted to the large sum of 13,582*l.*) the highest price obtained for a bull of this breed was 115*l.* 10*s.*, and for a cow 63*l.*; but, as not more than half the stock on the farm was supposed to have been sold, it is probable that some of the best cattle were reserved. Many other instances might however be adduced to prove—not that the relative value of the short-horned cattle has declined—but that extravagant prices are not now so generally given for superior stock, as formerly.



VII. The GALLOWAY BREED derives its appellation from the county of the same name, where, and also in some parts of the Lowlands of Scotland, these cattle are chiefly reared, and whence vast numbers are annually sent to Norfolk, and other English counties, to be fattened for the markets. In general they are black, or dark brindled; are without horns, except occasionally a small excrescence resembling them, and are rather under the medium size, being smaller than the Devons, though in some other respects resembling them, yet considerably larger than the north, or even the west Highlanders.

A true Galloway bullock is straight and broad in the back, and nearly level from the head to the rump; closely compacted between the shoulder and ribs, and also betwixt the ribs and the loins; broad at the loins, but not with hooked or projecting knobs. He is long in the quarters, but not broad in the twist; deep in the chest, short in the leg, and moderately fine in the bone; clean in the chop, and in the neck. His head is of a moderate size, with large rough ears, and full, but not prominent eyes, and he is clothed in a loose and mellow, though rather thick skin, covered with long, soft, and glossy hair.

In roundness of barrel, and fulness of ribs, the Galloway cattle may perhaps vie with even the most improved breeds. Their breadth over the hook-bones is not, indeed, to be compared to that of some of either the short or long horned, but their loins bear a greater proportion in width to the hook-bones, and they are shorter between the hooks and the ribs, which is in itself a valuable point, when accompanied with length of body. They are, however, rather coarse in the head and neck. Although short in the leg, they are generally fine in the bone;

for, notwithstanding the prejudice that formerly prevailed in favour of large bone, the Moorland farmers, convinced that large boned cattle could not thrive on their barren hills, never aimed at increasing the size of bone above what their pastures would carry, and by this judicious management have preserved the Galloway breed in its purity. It is, however, to be regretted that sufficient attention has not been paid to its improvement; and in many parts of the Lowlands it has been materially injured by an inconsiderate intermixture with Irish and Ayrshire cows, in consequence of a prevalent idea that the latter are superior milkers. Bulls of the most approved kinds have indeed been introduced from England, but without any apparent benefit to the native stock, and it seems to be now generally admitted, that the surest method of improving it consists in adherence to the pure breed. They certainly merit attention, for they already possess many valuable properties, which may yet be brought to still greater perfection. They are a hardy race, subsisting on the coarsest pastures, and increasing rapidly when removed to more favourable situations: they fatten hardly on the best parts, and their flesh is of the finest quality *.

The figure above delineated was drawn from a Galloway heifer exhibited at Lord Somerville's Cattle Show, in 1806.

Of this breed there is a variety termed SUFFOLK DUNS; they are also polled, but possess little of the beauty of the original stock, and are chiefly remarkable for the abundance of milk given by the cows.

VIII. The HIGHLAND BREED of Horned Cattle are chiefly reared in the western parts of Scotland. Their horns are

* See the Agric. Surv. of Galloway, p. 234. *et seq.*

usually of a middle size, bending upwards, and their colour is generally black, though sometimes brindled, or dun. Their hides are thick, and covered with long hair of a close pile, which nature seems to have intended as a protection against the severity of the climate under which they are bred, for they lose much of this distinction when reared in this country. In other respects they are not unlike the Galloway breed, many of whose best qualities they possess, and more particularly their hardiness of constitution, it having been repeatedly proved that they will thrive with such food and treatment as no tender cattle could endure; but, from being mostly bred in more exposed and mountainous situations, they rarely attain equal size.

Of this breed there are several distinct varieties, of which the principal are the *Kyloes*,—a short-horned breed, so named from the district of Kyle, in Ayrshire,—which are chiefly esteemed for the superior quality of the milk given by the cows; the *Argyleshire*, which are the largest of the real Highland breeds, and possess most of the properties already enumerated, except that they do not milk so well as the Kyloes; and the *Dunlops*, another variety, so called from the estate on which they were originally bred, which has long been celebrated for the excellence of its cheese. These last are, however, said to have been produced from a cross between a Highland bull and an Alderney cow, or, as some say, from an Alderney bull and an Ayrshire cow. Their colour varies from a dark brown, approaching that of the Devon, to the cream colour of the Alderney, and in both cases generally speckled with white. The head and horns are small; the neck thin; little dewlap; round and straight in the barrel, and perfectly free from any disposition to rise in the back bone; the loin, and space between the hips, flat and wide; in the leg rather short than otherwise, bearing a general similarity to the breed from which they spring. In some parts they are known under the name of *Cunningham cattle*, also from a district so called in Ayrshire *.

Besides these, there are the *Isle of Sky*, or *Western Kyloes*, and the *Norlands*, from the counties of Ross, Sutherland, Inverness, and Caithness, which are smaller than those already enumerated, and a mixed race, partly horned, and partly polled; black, brindled, and dun coloured; which are annually driven

* See the Agric. Surv. of the Isle of Man, p. 107.

in large numbers from the north to the English fairs, where they pass under the common appellation of *Scots*. They partake, in general, of the Galloway kindliness to fatten, and goodness of flesh; and, on the richer pastures of the south, soon become ready for the butcher.

IX. The WELSH BREED are chiefly black, slightly marked with white, and have thick horns, of a medium length, curving upwards. They are small, and short in the leg, but well proportioned, and clean, though not small-boned, with deep-barrelled bodies, and thin, short-haired hides. They are very quick feeders, and make excellent beef; and the cows are generally good milkers. The best kinds of this race of cattle are principally bred in the counties of Cardigan and Glamorgan, and in the southern and midland English counties, where they are in considerable demand for stocking inferior pastures. There is, however, a larger breed of a brown colour intermixed with white, and also having white horns; but they are long in the leg, thin in the thigh, and narrow in the chine. They are neither so compact as the black cattle, nor do they fatten so kindly, or make such good beef; but, though not in esteem with the grazier, they are active, and well adapted for the yoke.

X. The ALDERNEY BREED are so named from the island, on the coast of Normandy, whence they were first imported, although they are also bred in the neighbouring islands of Guernsey and Jersey. They are small sized; colour light red, or dun, mottled with white; horns short, and bone fine. As fatting cattle, they have but few good points; being thin and hollow in the neck, hollow and narrow behind the shoulders, sharp and narrow on the hucks, light in the brisket, and lean on the chine, with short rumps, and small thighs; but their flesh is fine grained, high coloured, and of excellent flavour. They are also very large in the belly; but this, as well as some of the points already mentioned, is rather an advantage to milch cows, to which purpose this stock is usually applied in this country; and their udder is well formed.

The Alderney cows are very rich milkers; and both on that account, and because of a certain neatness in their appearance, notwithstanding the defects in their shape, they command high prices. They are, therefore, mostly in the possession of gentlemen; who, rarely keeping a regular breeding stock, the cows are consequently crossed by any neighbouring bull, and thus

the pure breed is preserved in the hands of but very few persons.

There is a very prevalent notion that they will thrive on any kind of land, and they are therefore not uncommonly kept on bare paddocks, with the assistance of hay in winter. Like all light cattle, they certainly do not require the same support as larger animals; but their native pasture in the islands, is of the richest kind; and it is doubtless owing to the less nutritive herbage on which they are frequently fed in England, that the quantity of their milk is not equal to its quality.

Such are the chief breeds of the kingdom; and the description, being taken from the best authorities, may be considered as accurate as possible, in a general view. But it must be admitted, that there are great deviations in many animals of the same, and of the most approved stocks; and there are, besides, many crosses, and local breeds, distinguished by the name of the district, or the breeder, which it would be tedious to particularize.

CHAPTER II.

COMPARATIVE VIEW OF THE DIFFERENT BREEDS OF NEAT CATTLE.

FROM the previous introductory view of the various species of neat cattle, the reader will probably be enabled to form some estimate of the value of the respective breeds therein described; the two kinds, however, which are chiefly reared, are the *long-horned* and the *short-horned;* and, concerning their merits and demerits, there has long been a difference of opinion among the most experienced breeders. It may not, therefore, be altogether useless to offer a few comparative remarks to the consideration of the young grazier.

It has been observed, by Mr. Culley, that, "the long horns excel in the thickness and firm texture of the hides, in the length and closeness of the hair, in their beef being finer grained and more mixed and marbled than that of the short horns, in weighing more in proportion to their size, and in giving richer milk; but they are inferior to the short horns, in giving a less quantity of milk, in weighing less upon the whole, in affording less tallow when killed, in being slower feeders, and of a coarser make, and

more *leathery* or *bullish*, in the under side of the neck. In few words, the long horns excel in the hide, hair, and quality of the beef; the short horns in the quantity of beef, tallow, and milk. Each breed has long had, and probably may have, their particular advocates; but, if I may hazard a conjecture, is it not probable that both kinds may have their particular advantages in different situations? Why may not the thick firm hides, and long close-set hair of the one kind, be a protection and security against those impetuous winds and heavy rains to which the west coast of this island is so subject; while the more regular seasons and mild climate, upon the east coast, are more suitable to the constitutions of the short horn?" *

It should, however, be understood, that the preference above given by Mr. C. to the long-horned species, on account of the superior quality of their beef, applies only to the variety of that breed which was selected, improved, and recommended by the late eminent Mr. Bakewell, and which is described in the introductory view already referred to, under the name of the *Dishley breed*. In fact, Mr. C. is of opinion that "a breed of short-horned cattle might be selected, *equal*, if not *superior*, even to that very *kindly-fleshed* sort of Mr. Bakewell's, provided any able breeder, or body of breeders, would pay as much attention to these as Mr. Bakewell and his neighbours have done to the short horns." †

This, as the opinion of an eminent breeder, is entitled to great attention; and it has been corroborated by a fact stated in the Agricultural Survey of Northumberland, "that the long horns had been introduced into that county from the improved stocks of the midland counties, at different times, and by different breeders; but had, in most instances, given way again to the improved breed of short horns, and, at the time the first report was published, in 1804, had been totally abandoned by every breeder in the county; the improved breed of short horns, from the stock of Messrs. Collings, having proved themselves much superior." ‡

Since that period, continued exertions have been made for the improvement of the short-horned breed, and the great weight to which the cattle arrive must always ensure them a

* Culley on Live Stock, p. 80.

† Ib. p. 81.

‡ Page 140, 3d Edition, 1813; in which the assertion remains uncontradicted.

high rank in the estimation of the grazier; but the opinion of many of the best judges still continues to be divided regarding their comparative merit with that of the long-horns.

An experienced farmer, who appears to have examined both the breeds with great impartiality, states, "that the best of the short-horned being larger than any other kind require good keep, and more age than cattle in general: the oxen will improve to the age of seven years, and the cows to six; and if they are not well supported when young, will require another year: that they have large bones, and are said to be coarse-grained, and the beef not so marbled as that of some other kinds; though some of them die very fine beef." But he adds, "that many have larger shoulders * than the Rollright [*long-horned*] breed: that the best of this breed, especially the heifers and cows, are formed for the butcher superior in shape to any other kind; and that, of the four kinds of cattle put in competition with the Rollright, viz. the Devon, the Sussex, the Hereford, and the Yorkshire, [*short-horned,*] he is of opinion that none, at an early age, equal them for slaughter, or will pay so much money for three years' consumption." †

In confirmation of this, there is an opinion stated in several of the agricultural surveys of different counties, "that for beauty and symmetry of parts and disposition to fatten, the long-horned cattle are not to be excelled by any of their contemporaries;" ‡ "that they come quickest to perfection;" § "are preferable to short-horns, better feeders, and lay most beef in the best joints; are more thrifty on poor land, and are preferred at Smithfield." ‖ Yet, notwithstanding the decisive tone thus assumed, the question of superiority may still be considered as undecided: each have their advocates. Thus the Hereford surveyor gives a decided preference to the oxen bred in that county, although he admits, that the long-horned cows

* This, it should be observed, is a defect; for although the shoulders cannot be deemed offal, yet are they, comparatively, loss, as the flesh is of less value than that on the rump, loins, and chine: wherefore the most perfectly formed cattle are those that are the longest, and have the smallest shoulders in proportion to their size.

† Parkinson's Treatise on Live Stock, Vol. I. Ch. I. Sect. 15.

‡ Leicester Report, p. 218.

§ Rutland ditto, p. 121.

‖ Lincoln ditto, pp. 337. 339. 341. 2d Edition.

are equal to the Herefordshire *. The Somersetshire graziers will not allow that the north-country oxen possess any merit, comparatively with the Devon, either for labour or slaughter; but the surveyor himself, while maintaining their superiority in the yoke, is candid enough to admit, that they have many rivals in the Galloway, Leicester, Hereford, Glamorgan, and other cattle." † And the late Mr. Davis, of Longleat, an eminent agriculturist, although allowing that the comparative merits of the Devon and long-horned breeds are warmly contested in Wiltshire, yet, gives it as his own opinion, "that whatever may be the comparative merits of the two kinds of cows for the dairy, there is not a doubt but the Devonshire kind are the most proper for fatting; and, as to the oxen bred from the two kinds, it would be injustice to the Devonshire oxen even to make a comparison between them." ‡ Further trials of their respective qualities must be accurately made and faithfully recorded, before an undisputed preference can be awarded to either; for it cannot be concealed that local prejudice is often opposed to fact. The long-horns appear best adapted for grazing; being well protected by thick hides and long hair, and seemingly intended by nature for the range of pasture land. The short-horns, on the contrary, have thin hides and short hair; and being of a more tender constitution than the former, and arriving to greater weight, seem better calculated for the system of stall-feeding.

The next in size to the short-horned, are the *Hereford;* the oxen of which breed commonly attain the weight of 70 to 100 stone, of fourteen pounds, and frequently arrive at much greater size. They are considered by a competent judge §, when compared with other fashionable breeds, "as rather larger in the bone, and somewhat shorter in the carcass; rising a little higher in the chine, towards the shoulders, but generally broad, which renders the chine thick and heavy. Their hucks are round, wide from one to the other, and well covered with fat; their rump is well formed, and the thigh rather heavier than some delicate breeds. Their shoulders are mostly large, in consequence of which they have more coarse boiling beef than they ought; and, notwithstanding they have a great propensity to fatten and

* Hereford Report, p. 118.

† Somerset ditto, pp. 242, 243, 3d Edition.

‡ Wilts ditto, pp. 204, 205, 2d ditto.

§ Mr. Richard Parkinson, Treatise on Live Stock, Vol. I. Ch. I. Sect. 16.

die well filled with fat, it is often irregularly placed in patches." This defect is, however, probably owing to their having been worked; for although oxen that have been for several years at the yoke, will often become fat, it has been remarked that they are seldom so equally proportioned in every part with fat and lean as unworked steers, nor is the meat so juicy, and the brisket and lower parts are generally tough. When slaughtered at a proper age, the Herefords are heavily fleshed, the meat is fine in the grain and regularly marbled, with a better proportion of fat and lean than most other cattle, and they deservedly hold a high place in the estimation of the butcher.

An interesting experiment made at the Earl of Egremont's farm at Petworth, in Sussex, might, if it stood alone, be considered as, in a great measure, decisive of the relative value of this breed, as fatting cattle, to those of Devon and Sussex. Eight beasts of the three breeds, taken indiscriminately from the stock, were put up to fatten on a mixture of barley-meal and flax-seed. For the first seven weeks they had each three gallons every day, of which one fourth was flax-seed; and for the remainder of the time they had three gallons, of which one-third was flax-seed, ground together and mixed up with some wheat-chaff, both to facilitate digestion, and prevent it from sticking in their throats. Besides this, they had each thirteen pounds of hay weighed to them three times each day. They were sixteen weeks fattening, and their respective weight when put up, and when fatted, was as follows:—

	Nov. 27.			March 19.			Gain.			
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	
No. 1.	17	0	7	20	2	0	3	1	21	Hereford.
2.	15	3	25	18	3	14	2	3	17	
3.	15	0	11	17	2	0	2	1	17	
4.	14	1	21	17	0	0	2	2	7	Sussex.
5.	14	0	25	17	0	0	2	3	3	
6.	14	0	25	17	0	0	2	3	3	
7.	13	2	7	16	2	0	2	3	21	Devon.
8.	13	0	14	15	0	0	1	3	14	

Thus, it will be perceived, that, *upon equal quantities of food*, the Herefords put on the most flesh; nor will it escape observation that, in that, the largest bullocks had the advantage. It has, indeed, been remarked, that the thorough bred Hereford cattle, that have attained their full size, require a less proportion of food to make them fat, than others of the same breed that are not so highly bred, nor so handsomely formed; and that, so far from requiring a larger quantity of food, they will

consume a much less proportion than other smaller oxen of a mixed breed *.

However, another experiment, made nearly at the same time as the former, at Woburn, under the direction of the late Duke of Bedford, gives a different result, both as regards the breeds, and the weight of the cattle.

Six oxen, two Herefords, two Devon, one of the Sussex, and one of the Leicester long-horned, were put up at one time; and (with the exception of one of the Herefords, which had not any cake) were fed on oil-cake, turnips, and hay, for an equal number of days, and their respective weights, at each period, were as follows:—

	Food given		returned	consumed	1st weight cwt. qrs. lbs.			2nd weight cwt. qrs. lbs.			Live weight gained cwt. qrs. lbs.		
No. 1. Hereford	Turnips	3060	360	2700	17	0	1	18	3	0	1	2	27
	Hay	530	43	487									
2. Ditto	Oil-cake	450	26	424	18	1	0	21	0	25	2	3	25
	Turnips	3040	328	2712									
	Hay	467	34	433									
3. Devon	Oil-cake	450	12	438	14	1	7	17	2	7	3	1	0
	Turnips	3090	422	2668									
	Hay	376	81	295									
4. Ditto	Oil-cake	450	7	443	14	2	14	19	1	0	4	2	14
	Turnips	3000	364	2636									
	Hay	475	32	443									
5. Sussex	Oil-cake	450	17	433	16	2	0	19	3	0	3	1	0
	Turnips	3030	375	2655									
	Hay	443	51	392									
6. Leicester	Oil-cake	450	15	435	15	2	14	18	2	0	2	3	14
	Turnips	3010	358	2652									
	Hay	447	47	400									

* See Agricultural Survey of Sussex, p. 343.

From this it would appear, that the Devonshire cattle were superior, as the ox (No. 4.) of that breed, gained 185lbs. more flesh than the Hereford ox (No. 2.) upon a nearly equal quantity of food, of similar quality; and, in further contradiction to the former experiment, that, in this, the cattle throve in an inverse proportion to their weight, the smaller having the advantage. But it is also worthy of remark, that the difference was equally striking between the two Devons, though of equal weight; and this exemplifies the truth of an observation of daily occurrence, that cattle of the same breed, are yet of different constitution, and do not always possess an equal aptitude to convert their nourishment into fat. Thus it will be found, that of a score of bullocks of the same stock, age, and apparent quality, fed and managed alike, some will fatten much sooner than others, and arrive at greater weight; and that, in those which, when alive, appear equal to the eye and touch, a manifest difference will often be found when they are slaughtered. Therefore, however justly some breeds may be preferred, upon the general principle that the progeny partake of the disposition of the sire and dam, yet this theory is frequently contradicted in practice. The state of the parent stock at the time of copulation, the health of the cow during the period of gestation, and the management of the calf during its growth, must all have an influence upon the future condition of the animal; and there are, doubtless, other hidden causes which have either escaped the observation, or are beyond the controul of man. Experience has indeed proved, that although comparative experiments to ascertain the relative value of cattle are not to be slighted, yet that they are often contradictory; and, therefore, that the result is not always entitled to implicit faith.

In drawing a comparison between the Galloway and other most approved breeds, the surveyor of that district, although acknowledging their inferiority in respect of weight, yet maintains, that in many other of the most valuable qualities they do not come far short of any; and in the essential property of a tendency to thrive and fatten, the correctness of that opinion must be admitted; but it cannot be so readily conceded, as he asserts, "that when the merits of cattle come to be appreciated on just grounds, and the influence of quackish arts is at an end, many breeds which are now the most fashionable, will cease to attract attention; and the Devons and Kyloes will then, in all

probability, be the only ones with which the Galloways will have to contend for pre-eminence." *

In support of this opinion, the surveyor has produced a table of the relative proportions between a Galloway cow and two acknowledged, as he says, to be the very best of the long and short horned breeds, in all those points which are considered to be of the greatest importance; from an examination of which the preponderance would appear to be in favour of the former. Perhaps he attaches too much weight to these comparisons, for it is not in form alone that value entirely consists: many beautiful cattle are deficient in constitution; and others, though very plain, possess great aptitude to fatten, and are superior milkers. But the table merits attention, apart from any comparison, as it displays, at one view, the proportions of chosen animals of three different breeds, and therefore, it is presumed, cannot fail to interest the reader.

The late Mr. Bakewell made many comparisons between different breeds of cattle, and it is much to be regretted that the observations of so acute and intelligent a man, and one so deeply versed in the subject, should be lost to the public; but he was singularly incommunicative; and there is little further known of his experiments, than that he put up three new milched cows, in separate stalls—a short-horned, a Scotch, and one of his own breed—and the result was, that the short-horned ate most food, and gave much the greatest quantity of milk; the Scotch ate less food, and gave less milk, but produced most butter; and the Dishley ate least food, gave the least milk, and made the least butter, but laid on the most flesh; whence it would appear, that the Kyloe cows are superior to the other two for the dairy-man, and the long-horned cows for the grazier; but this is by no means decisive of the relative value of the oxen.

The relative estimation of the flesh of the principal breeds at Smithfield market, and the average difference in price for the best qualities of each, in March, 1829, is as follows:

Scotch oxen	4*s.* 8*d.* per stone of 8lbs. to sink the offal.		
Leicester, Hereford, and fine short-horns	4 4	ditto	ditto
Lincoln short-horns . .	4 0	ditto	ditto
Coarse inferior beasts . .	3 10	ditto	ditto

* Agricultural Survey of Galloway, p. 245.

A Cow of the GALLOWAY BREED compared with Two of the BEST LONG and SHORT-HORNED BLACK CATTLE.

	Brindled Beauty, bred at Glencaird, in Minnigaff.—Height 44 inches.	Yellow Dishley, bred by Mr. Bakewell.—Height 53 inches.	Difference.		Inches nearly.
	Proportion, as 45 to 54, or as 5 to 6.		In favour of Galloway.	In favour of Long Horns.	
	Inches. Inches.	Inches. Inches.	Inches.	Inches.	
Width of Hooks	20½ × 6 = 123	21½ × 5 = 107½	15½		2½
——— Loin	15 × 6 = 90	16 × 5 = 80	10		1¼
Length of Quarter	18 × 6 = 108	19 × 5 = 95	13		2
——— Back	54 × 6 = 324	70 × 5 = 350		26	5
——— Space	8 × 6 = 48	10½ × 5 = 52½	4½		¾
Girth at the Rib	83½ × 6 = 499½	90½ × 5 = 452½	47		8
——— Chine	69 × 6 = 414	75 × 5 = 375	39		6½
——— Neck	29 × 6 = 174	35 × 5 = 175	1		1/64
——— Shank	6 × 6 = 36	7½ × 5 = 37½	1½		
	Brindled Beauty, as above.—Height 44 inches.	Phœnix, bred by Mr. Charles Collings.—Height 56 inches.		In favour of Short Horns.	
	Proportion, 5½ : 7 = 44 : 55.				
Width of Hooks	20½ × 7 = 143½	26¼ × 5½ = 147½		3¾	½
——— Loin	15 × 7 = 105	19¼ × 5½ = 105⅞		⅞	⅛
Length of Quarter	18 × 7 = 126	21 × 5½ = 115½	10½		1½
——— Back	54 × 7 = 378	61½ × 5½ = 338½	39½		5½
——— Space	8 × 7 = 56	15½ × 5½ = 85⅜	34⅜		5
Girth at Chine	69 × 7 = 483	85 × 5½ = 467½	15½		2¼
——— Neck	29 × 7 = 203	38½ × 5½ = 211¾	6¾		1
——— Shank	6 × 7 = 42	7½ × 5½ = 41¼		¼	1/16

And a further judgment may be formed from the prizes awarded, during the last three years, by the Smithfield Cattle Club; a list of which will be found in the Appendix, No. I.

That consideration, which this important subject requires, has of late years been amply bestowed upon the improvement of British cattle; and beside the respectable breeder already mentioned, the labours of the late and present Dukes of Bedford, of the late Mr. Fowler, Lord Somerville, and Mr. Westcar, of the Messieurs Collings and Culleys, Mr. Princep, Mr. Mason, of Chilton, Mr. Ashley, and Mr. Coke, of Norfolk, as well as of many other noblemen and gentlemen who have recently applied themselves to agriculture, and whose exertions, both as amateurs and professionally, claim the gratitude and good wishes of every real friend to his country,—the various excellent societies established in many parts of Great Britain for the promotion of this public spirited purpose, have mainly contributed to the high state of perfection which this important branch of rural science has attained.

It has been hinted, when discussing the subject of buying cattle, that it will be advisable to select them, either from stock feeding in the neighbourhood, or from those sorts which are best calculated for the nature and situation of the soil. This remark should be constantly kept in view, with regard to the breeding of cattle; let, therefore, that breed which is most profitable and best suited to the situation of the farm, first be ascertained; and, having succeeded in this desirable object, let it be the breeder's study to improve that sort to the utmost, by selecting and breeding from those which to beauty of form unite the more essential qualities of possessing *kindly* skins, and of weighing most in the valuable parts, together with a disposition to lay fat on the best points, as well as to fatten in a short period of time.

Before we conclude this subject, it may not be amiss to notice the neat cattle reared in the sister island. Few countries are, perhaps, so well adapted for the breeding of cattle of every description; and it is in consequence of this peculiar felicity of soil and situation, that our fleets are supplied with the immense quantities of prime beef necessary for the support of their crews.

The breed of *Irish cattle*, of which many thousand carcasses are annually exported, is distinguished by little variety, except-

ing that which necessarily arises from the difference of situation. They are remarkable for strength of constitution; and appear to be a mixed race, between the long-horned breed and the Scotch or Welch cattle. The counties of Meath, Roscommon, Clare, Limerick, Cork, and Tipperary, are chiefly celebrated for the vast herds of cattle which are there annually bred and slaughtered for exportation; and many of the most public-spirited breeders have, of late years, incurred very considerable expense by purchasing prime long-horned stock from England, for the purpose of improving their breeds; a measure that has already been attended with the most beneficial effects, and which will doubtless, in the course of a few years, prove a source of great wealth to that island. It, however, cannot be denied that these exertions have not hitherto been sufficiently general to effect any very manifest improvement in the common stock of the country. The whole farming system of Ireland is defective; and, although grazing is better understood there than tillage, it is still in its infancy. The usual practice is to fatten in the field, on grass alone, without the assistance of artificial grasses, roots, or oil-cake. The beasts are purchased at the fairs without any regard to the breed; and being, in a large proportion, bred from cottagers' cows, which are necessarily taken from the worst stock, they are commonly ill-shaped and ill-thriven. The truth is, that capital is wanting; but it is to be hoped that those unhappy dissensions which had destroyed confidence will now no longer distract so fair a portion of the empire, and that so promising a field for the enterprising agriculturist will not continue to suffer neglect.

CHAPTER III.

GENERAL OBSERVATIONS ON BUYING AND STOCKING A FARM WITH CATTLE.

"THE benefit", observes that enlightened agriculturist, Mr. Young *, "to be derived from the occupation of land, depends so much on the farmer commanding the requisite capital, that it is extremely necessary for the young beginner to be well ad-

* Farmer's Calendar, Ed. of 1804, p. 481.

vised on this essential point." Assuming it therefore as certain, that such a beginner is provided with that indispensable requisite, we shall proceed to state a few general hints on the buying and stocking of his farm with cattle; and shall introduce, under the respective accounts of rearing and breeding the different species, such remarks on their various merits and demerits as will materially assist him in the course of his labours.

The first object of attention, then, is to consider the proportion between his stock and the quantity of feed which will be necessary to support them. The nature, situation, and fertility of the soils that compose his farm are equally worthy of notice, as well as the purpose for which he designs more particularly to rear or feed his cattle; whether for the pail, or with the view of supplying the markets. In fact, it will be expedient to observe the greatest exactness in this proportion, because, in case he should overstock his land, he will be compelled to resell before the cattle are in a fit state for the market, and, consequently, at certain loss; while, on the other hand, he will incur a diminution in his profit, if he should not stock his land with as many cattle as it will bear.

Formerly, a great prejudice prevailed in favour of big-boned, large beasts, but it has been ascertained, that this breed is, in point of profit, much inferior to the middle-sized kind; and, by a careful attention to the selection of stock, no inconsiderable progress may be made towards the improvement of the different species. Among the various professional breeders of modern times, few have attained greater celebrity than the late Mr. Bakewell, of Dishley, to whom we are indebted for many new and important improvements in the science of rearing cattle. The principle which he invariably adopted was, to select the best beast, that would weigh most in the valuable joints; so that, while he gained in point of shape, he also acquired a more hardy breed; and, especially by attending to the *kindliness* of their skin, he became possessed of a race which was more easily fed and fattened than any other.

For many years, the invariable practice was to judge by the *eye* only, without regarding the other qualities of the animal intended to be purchased; but, in the present improved age, a more rational mode of forming the judgment has been adopted. The sense of touch is now brought in aid of the sight; and, by repeated practice, the art of judging of the kindliness to fatten

has been brought to such perfection, that any well-informed breeder, *who has personal experience*, can, on examining lean beasts, tell, almost instantaneously, in what points or parts they will or will not fatten.

It might be expected that the result of such experience should be here stated, and some rules be laid down, by which a judgment on this important point could be formed; but, in fact, this knowledge can only be acquired by constant *handling* of both lean and fat beasts, and can only be described in general terms. Sir John Sinclair has justly remarked *, that, "when the hide or skin feels soft and silky, it strongly indicates a tendency in the animal to take on meat; and it is evident, that a fine and soft skin must be more pliable, and more easily stretched out to receive any extraordinary quantity of flesh than a thick or tough one. At the same time, thick hides are of great importance in various manufactures. Indeed, they are necessary in cold countries, where cattle are much exposed to the inclemency of the seasons; and, in the best breeds of Highland cattle, the skin is thick in proportion to their size, without being so tough as to be prejudicial to their capacity of fattening."

In the selection, therefore, of live stock in general, the young farmer will find it necessary attentively to consider the following particulars:

I. *Beauty, or symmetry of shape;* in which the form is so compact, that every part of the animal bears an exact consistency, while the carcass should be deep and broad, and the less valuable parts (such as the head, bones, &c.) ought to be as small as possible. The carcass should be large, the bosom broad, and chest deep; the ribs standing out from the spine, both to give strength of frame and constitution, and likewise to admit of the intestines being lodged within the ribs; but yet not so much as to be what is called *high-ribbed*, as the butchers consider it an indication of deficiency in weight of meat. Further, the shoulders ought not only to be light of bone, and rounded off at the lower point, but also broad, to impart strength, and well covered with flesh. The back also ought to be wide and level throughout; the quarters long, the thighs tapering and narrow at the round bone, but well covered with flesh in the twist; and the flank full and large. The legs ought to be straight below the knee and hock, and of a moderate

* "Hints regarding Cattle," p. 157, &c.

length; light boned; clean from fleshiness, yet having joints and sinews of a moderate size, for the united purposes of strength and activity. In these points all intelligent breeders concur; but, as beauty of shape too often depends on the caprice of fashion, it is more requisite to regard,

II. *Utility of form*, or that nice proportion of the parts which has already been noticed.

III. The *flesh*, or texture of the muscular parts; a quality which was formerly noticed only by butchers, but the knowledge of which is justly deemed essential by the enlightened breeders of the present day; and although this quality necessarily varies according to the age and size of cattle, yet it may be greatly regulated by attention to the food employed for fattening them. As a knowledge of this requisite can only be acquired by practice, it is sufficient to state, that the best sign of good flesh is that of being *marbled*, or having the fat and lean finely veined, or intermixed, when the animals are killed; and, while alive, by a firm and mellow feel.

IV. In *rearing live stock* of any description, it should be an invariable rule to breed from small-boned, straight-backed, healthy, clean, kindly-skinned*, round-bodied, and barrel-shaped animals, with clean necks and throats, and little or no dewlap; carefully rejecting all those which may have heavy legs and *roach* backs, together with much appearance of offal. And, as some breeds have a tendency to generate great quantities of fat on certain parts of the body, while in others it is more mixed with the flesh of every part of the animal, this circumstance will claim the attention of the breeder as he advances in business.

V. In the *purchasing of cattle*, whether in a lean or fat state, the farmer should on no account buy beasts out of richer or better grounds than those into which he intends to turn them; for, in this case, he must inevitably sustain a very material loss, by the cattle not thriving, particularly if they be old. It will, therefore, be adviseable to select them, either from stock feed-

* As this word may probably often appear in the course of the subsequent pages, it may not be altogether irrelevant to state, that it implies a skin which feels *mellow*, i. e. soft, yet firm to the touch, and which is equally distant from the hard, dry skin, peculiar to some cattle, as it is from the loose and flabby feel of others.

ing in the neighbourhood, or from such breeds as are best adapted to the nature and situation of the soil.

VI. *Docility of disposition*, without being deficient in spirit, is of equal moment; for, independently of the damage committed by cattle of wild tempers on fences, fields, &c., which inconvenience will thus be obviated, it is an indisputable fact, that *tame beasts require less food to rear, support, and fatten them*; consequently every attention ought to be paid, early to accustom them to be docile and familiar.

VII. *Hardiness of constitution*, particularly in bleak and exposed districts, is indeed a most important requisite; and in every case it is highly essential to a farmer's interest to have a breed that is liable neither to disease nor to any hereditary distemper. A dark colour, and in cattle which are kept out all the winter a rough and curled *pile* or coat of hair, are, in the popular estimation, certain indications of hardiness: but it must be obvious to every thinking person, that this quality, though in some respects inherent in particular breeds, depends, in a great measure, upon the method in which cattle are treated.

There is, indeed, a rather prevalent opinion, that white is a mark of degeneracy, and that animals of the most vivid hues possess the greatest portion of health and strength; in proof of which it has been instanced that among mankind, a healthy habit is visible in the floridness of the complexion; as sickness is perceptible in the paleness of the looks, and the decrepitude of age in the whiteness of the hair. It has also been remarked that gray horses are commonly of a tender constitution, until crossed with darker breeds; and that among the feathered tribe, the common poultry, with high coloured plumage, are in all respects superior to the white. But it has been justly observed in reply, that the powerful Polar bears, and many of the strongest birds, as the goose and swan, are white: nor will it escape observation, as more immediately touching the present subject, that the wild cattle are invariably of that colour; and that the highest bred Herefords are distinguished by white faces *.

* It is stated, in the Agricultural Survey of Leicestershire, as the remark of a scientific observer of the cattle usually bred in that county, "that those of a deep red, dark liver colour, or black, with tanned sides, are the hardiest, and have the best constitutions; will endure the severest weather, perform the most work, live to the greatest age, and fatten on such food as would

VIII. Connected with hardiness of constitution is *early maturity*, which, however, can only be attained by feeding cattle in such a manner as to keep them constantly in a growing state. By an observance of this principle, it has been found that beasts and sheep, thus managed, *thrive more in three* years, than they usually do in *five* when they have not sufficient food during the winter, by which, in the common mode of rearing, their growth is checked.

IX. A *kindly disposition* to take fat on the most valuable parts of the carcass, at an early age, and with little food, when compared with the quantity and quality consumed by similar animals. On this account, smaller cattle have been recommended as generally having a more natural disposition to fatten, and as requiring, proportionably to the larger animal, less food to make them fat; consequently, the greater quantity of meat for consumption can be made per acre. "In stall-feeding,"—the nature, method, and advantages of which will be stated in a subsequent chapter,—it has been remarked, that, "whatever may be the food, the smaller animal pays most for that food; in dry lands, the smaller animal is always sufficiently heavy for treading; in wet lands less injurious."* But this opinion is combated by many able judges, who still contend that the largest animals are the most profitable. They doubtless are so on good keep; but the smaller animals will thrive on soils where heavy beasts will decline.

X. *Working*, or an aptitude for labour: a point of infinite importance in a country whose population is so extensive as that of Britain, and where the consumption of grain by horses has so material an influence on the comforts and existence of the inhabitants. As, however, there is a difference of opinion on this subject, the reader is referred to the chapter where the question is fully discussed. But, whether kine be purchased for the plough, or for the purpose of fattening, it will be necessary to see, in addition to the essentials already stated, that they are young, in perfect health, full-mouthed, and not broken either in tail, hair, or pizzle; that the hair *stare* not,

starve those of weaker colours." But in opposition to this we have, in the Annals of Agriculture, the assurance of Mr. Campbell, a practical and extensive breeder, that, upon repeated comparative trials, "he has had bulls, oxen, and cows, of a white breed, as healthy and hardy as any others."

* Papers of the Bath and West of England Society, Vol. X. p. 262.

and that they are not hide-bound, otherwise they will not feed kindly. The same remark is applicable to cows intended for the pail, the horns of which should be fair and smooth, the forehead broad and smooth, udders white, yet not fleshy, but thin and loose when empty, to hold the greater quantity of milk, but large when full; provided with large dug-veins to fill it, and with four elastic teats, in order that the milk may be more easily drawn off.

XI. Beside the rules above stated, there are some particulars with regard to the *age* of neat or black cattle and sheep, which merit the farmer's consideration.

"Neat cattle cast no teeth until turned two years old, when they get two new teeth; at three they get two more; and in every succeeding year get two, until five years old, when they are called *full-mouthed*, though they are not properly full-mouthed until six years old, because the two corner teeth, which are last in renewing, are not perfectly up until they are six."*

The horns of neat cattle also supply another criterion by which the judgment may be assisted, after the signs afforded by the teeth become uncertain. When three years old, their horns are smooth and handsome; after which period there appears a circle, or wrinkle, which is annually increased as long as the horn remains; so that, according to the number of these circles or rings, the age of a beast may be ascertained with tolerable precision, unless such wrinkles are defaced, or artificially removed, by scraping or filing; a fraudulent practice, which is but too frequently adopted, in order to deceive the ignorant or inexperienced purchaser with respect to the real age of the animal. There is also a tip at the extremity of the horn, which falls off about the third year.

The bull is termed a *bull calf* until he is one year old, and then a *yearling bull*, or, in some places, a *stirk*, and afterwards a two, three, four, and five years old bull, until six, when he is *aged*. When castrated, he is called an *ox*, or *stot-calf*, until a yearling, and then a *steer*, until four, when he becomes an *ox*, or *bullock*. The cow does not assume that name until four years old, previous to which she is called, first a cow-calf, and then a yearling, two, and three year old *heifer*, or *quey*.

* Culley on Live Stock, pp. 208, 209.

CHAPTER IV.

OF THE BULL.

In the preceding chapter, some general remarks on the purchasing of cattle have been given, and a few characteristic features have been pointed out, in order to assist the young adventurer in this branch of rural economy. But, as the *male* of every species is the principal in the breed and generation, it will not be useless to give an account of that form or shape which is so essential to the constituting of a perfect animal.

A bull, then, ought to be the most handsome of his kind; he should be tall and well made; his head should be rather long, but not coarse, as fineness of head indicates a disposition to fatten; and, as it is designed by nature to be the chief instrument both of offence and of defence, it ought to present every mark of strength; his horns clean, and bright; his large black eyes lively and protuberant; his forehead broad and close set, with short, curled hair; his ears long and thin, hairy within and without; muzzle fine; nostrils wide and open; neck strong and muscular, not incumbered with a coarse, wreathy skin, but firm, rising with a gentle curve from the shoulders, tapering to the part where it is connected with the head; dewlap thin, and but little loose skin on any part. Further, his shoulders should be deep, high, and moderately broad at the top; the bosom open; breast large, and projecting well before his legs; back straight and broad, even to the setting on of the tail, which should not extend far up the roof, but be strong and deep, with much lank hair on the under part of it; ribs broad and circular, rising one above another, so that the last rib shall be rather the highest; the fore thighs strong and muscular, tapering gradually to the knees; the belly deep, straight, and also tapering a little to the hind thighs, which should be large and square; the roof wide, particularly over the chine and *hips*, or *hooks*; the legs straight, short jointed, full of sinews, clean and fine boned; knees round, big, and straight; feet distant one from another, not broad, nor turning in, but easily spreading; hoofs long and hollow; the hide not hard, or stubborn to the touch; the hair uniformly thick, short, curled, and of a soft texture; and the body long, deep, and round, filling well up to the shoulder and into the groin, so

as to form what has not improperly been termed a round, or *barrel-like* carcass.

The bull attains the age of puberty generally at the end of from twelve months to two years; but it has been thought advisable to restrain him from the propagation of his species until he has arrived at his full growth, which is about four years; for, if this animal be suffered to breed earlier than three years, the stock is liable to degenerate. It must, however, be admitted, that a contrary opinion prevails among many eminent breeders; who maintain that the bull is in his full vigour at eighteen months old, at which age his progeny will display the most strength; and a prominent instance in point has been adduced in the practice of Mr. Vandergoes, of the Hague, who is reported to have had the finest stock of dairy cows in Holland, and who attributed the excellence of his breed to his using none but young bulls, which he always sold at three years of age. Others again contend, that the offspring of a bull, if well bred, becomes generally better until he reaches seven or eight years, and indeed, until his constitution is impaired by age *. Nor ought more than twenty cows to be allotted to one bull, or this animal be permitted to serve more than two cows in one day; for, although the cupidity of persons who hire out bulls, very generally exposes them to much greater trials of strength, it yet exhausts them, and they can no longer be depended upon as sure getters of stock; nor will the stock, if produced, be of equal vigour as when the number of cows is limited.

The bull, as well as the cow and ox, generally lives about fourteen years; but the progress of decay is usually perceptible after he has attained the age of ten years. His temper is naturally fierce and ungovernable, which is not a little increased by his being permitted to live quietly in the best pastures, without being applied to any useful purpose but that of propagating his species. Hence this animal, naturally vicious, often becomes so mischievous as to endanger many valuable lives; an evil which, we conceive, might be remedied by training him to labour. For, we doubt not but if he were moderately worked, and allowed to indulge his desires during the breeding season, he would, by being inured to labour, and attended by mankind, become gradually tame, and harmless as the horse or any other often naturally vicious animal. Several experiments, indeed,

* See Sir John Sinclair's Code of Agriculture, 3d Edit. 1821, p. 108.

have been made for this purpose; and, from their successful result, we think the practice of working bulls may be advantageously adopted; especially as these animals are not only broken in with little difficulty, and work well, but also because they recover from fatigue much sooner than any ox.

For the prevention of accidents from mischievous bulls, an ingenious and simple contrivance has been suggested by Henry James Nicholls, Esq. of Woodhall, near Wisbeach, on whom the Society for the Encouragement of Arts, Agriculture, &c. in 1815 conferred a premium of ten guineas, for his invention. Of its form and application the following engravings will convey a correct idea.

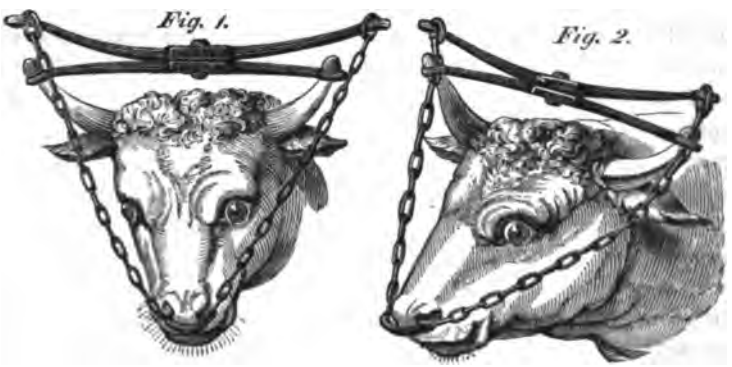


Fig. 1. Represents a *front* view of the apparatus, as affixed to the head of the animal. It consists of a straight piece of wood or iron (the latter is the preferable material) stretching from horn to horn, perforated at each end so as to pass over the tips, and fastened on them by the usual metal nuts. On the centre of this is rivetted *a curved bar of iron*, bending upwards, which moves easily on the rivet, and has holes at each end containing the upper round link of a chain. These chains again unite in a strong iron ring, which opens by a hinge and screw, and passes through the bull's nose. The effect of this contrivance is as follows:—any person seeing a vicious animal approach may easily avoid him; but if the beast should make a push *forward*, the curved iron bar will prevent any bad consequences; and if he move in the smallest degree to the *right or to the left*, the bar communicating by the chain with the ring upon his nose, will bring him immediately to check. This

lateral operation is delineated in Fig. 2. An additional advantage resulting from the use of this invention is, that a beast may, with the smallest power, be led in any direction.

CHAPTER V.

OF THE COW.

A *perfect breeding cow* ought to have a fine head, with a broad, smooth forehead; black eyes; clean horns; a smooth, elastic skin; a large deep body; strong, muscular thighs; a large, white udder, with long and tapering teats, together with every other token requisite in a bull, allowing for the difference of sex. Further, such animal ought particularly to be young; for milch kine are not good for breeding after they are twelve years old, though they will often live a much longer time if their pasture be good, and they be kept from diseases.

Cows are purchased either with a view of being fattened for sale, for breeding, or for the purposes of the dairy: in the former case, it will be advisable to attend to the *kindliness* of their skins, and disposition to fatten; with regard to those which are intended for breeding, care should be taken to select the best of that particular stock intended to be raised; and for the dairy, those which yield the most, and the richest milk: a subject which will be treated more at large under that head *. In fact, those beasts which yield great quantities of milk, seldom fatten quickly; and repeated unsuccessful efforts to unite these two irreconcileable properties, have proved that the different breeds of neat cattle have not hitherto been brought to entire perfection. There is, it is true, a middling kind of cows, which give a tolerable quantity of milk, and also keep in pretty good condition; but, though many of this sort will become very fat when they are dried, or their milk is taken from them, yet they will not fatten so speedily or so well as those which yield a less portion of milk, and which are more kindly disposed to fatten while they are in a milking state.

As, however, the dairy constitutes, in many parts of the kingdom, an object of great importance, it is a point worthy of the

* Book II.

most deliberate discussion, whether a particular breed ought to be kept for that purpose only, or whether it be preferable to have stock calculated partly for the butcher, and partly for the dairy. "It is probable," observes Sir John Sinclair *, "that, by great attention, a breed might be reared, the males of which might be well calculated, in every respect, for the shambles; and the females of which might, when young, produce abundant quantities of good milk; yet, when they reached eight or nine years of age, might be easily fattened. This", he justly remarks, "would be the most valuable breed that could be propagated in any country; and, indeed, some of the best English and Scottish breeds have almost reached that point of perfection." Nor would the attainment of that object be improbable, if more attention were paid to use bulls from the best fatting stock with the best milch cows.

The cow is supposed, by some eminent naturalists, to arrive at puberty at the end of eighteen months, though instances have occurred where these animals have produced calves before that time. It is, indeed, said by some breeders, in the northern part of this island, that young cows may be sent to the bull as early as even *one year* old; but there is then much danger in calving; and although the practice would certainly be an essential improvement where the dairy constitutes a primary object, provided their growth would not thus become stinted, it is yet generally considered injudicious. It is, therefore, adviseable not to permit cows to take the bull earlier than two years, though many breeders defer it another year; and, in conformity to the latter opinion, the late eminent Mr. Bakewell deferred sending his cows to bull till they were three years old; but they often missed calf, which accident Sir John Sinclair † attributes to this circumstance: but the most proper period must in some measure depend on the breed, on the time at which the heifer was herself dropped, and on her condition; as some which have been well kept will be more forward at two than others, which have been stinted, at three years of age. In case, however, a cow produces a calf before she enters upon her third year, the animal should be removed from her; and it

* In a most interesting communication of Hints regarding Cattle, inserted in the Farmer's Magazine, vol. iii. page 156.

† Hints regarding Cattle, Farmer's Magazine, vol. iii. p. 160.

will be proper to milk her for the three following days, to prevent the udder from becoming sore, but afterwards to forbear milking.

The most advantageous time, in general, for a cow to *take the bull* is, from the commencement of May till the middle or close of July, so that she may calve in January, and thence forward till March or April. And as it is, in most places, a matter of considerable importance to have a uniform supply of milk throughout the year, we conceive it would prove a source of profit to a farmer, possessing twelve, or any large number of milch kine, so to arrange the circumstance of breeding as to have three or more cows dry at one time.

The period of time during which cows are allowed to *run dry* previously to calving, is by no means settled. By some graziers they are recommended to be laid dry when they are about five or six months gone with calf; but repeated and successful experiments prove, that six weeks or two months are sufficient for this purpose; indeed, cows kept in good condition are sometimes drawn until within a fortnight of calving; but this is a practice not to be recommended; for if the cow *springs* before she is dry, serious injury may ensue.

The *symptoms of calving* are a distension, or springing, of the udder, and gradual yielding of the ligaments of the couples, or rump-bones, as well as an increased leanness between the shape and the udder, all of which are generally perceptible about a fortnight before the cow is at her full time; when that arrives it is marked, first, by a slight elevation of the tail, and then by general uneasiness until the pains commence.

In general, the cow *conceives* after once taking the bull; but, if she should chance to fail, she should go again to bull within three weeks after. To prevent, however, this accident, it will be advisable, as soon as convenient after her return home, to throw a pailful of water on her udder behind, and to keep her that night separate from any others: for it not unfrequently happens that cows (after taking the bull) will ride each other; in consequence of which they are apt to misconceive, and it is also supposed that, when they have acquired that habit, the quantity of milk they yield is thereby greatly diminished.

The desire of having a frequent supply of calves has induced many to have recourse to *artificial means*, in order to induce cows to take the bull; a measure which cannot be sufficiently

most deliberate discussion, whether a particular breed ought to be kept for that purpose only, or whether it be preferable to have stock calculated partly for the butcher, and partly for the dairy. "It is probable," observes Sir John Sinclair *, "that, by great attention, a breed might be reared, the males of which might be well calculated, in every respect, for the shambles; and the females of which might, when young, produce abundant quantities of good milk; yet, when they reached eight or nine years of age, might be easily fattened. This", he justly remarks, "would be the most valuable breed that could be propagated in any country; and, indeed, some of the best English and Scottish breeds have almost reached that point of perfection." Nor would the attainment of that object be improbable, if more attention were paid to use bulls from the best fatting stock with the best milch cows.

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deprecated, for the most efficacious mode of obtaining this object undoubtedly consists in keeping them in good heart; in consequence of which nature will predominate over the animal's body, and cause it to show signs of procreation through the medium of the creature's constitutional feelings. When it has been resorted to, one of the most effectual means has been found to give a couple of quarts of milk, warm from a cow in season, but before she has taken the bull, and in a few days it has taken effect. The time when a *cow is in season*, is known by her restlessness, by her riding on other cattle; and by the inflamed appearance of the external parts, accompanied by a discharge from the vagina. These symptoms only continue for three or four days, sometimes not so long, and do not return for a fortnight or three weeks; and when conception has taken place they disappear.

The *period of gestation*, or time during which the cow goes with calf is various: with a bull calf, she usually goes about forty-one weeks, with a difference of a few days either way; a cow calf comes in less time. Between nine and ten months, therefore, may be assigned for the period of gestation; at the end of which time she produces one calf; though instances sometimes occur when two, or even three, are brought forth. It may not however be useless to remark, that some cows are naturally *barren*, which is said to be the case when a male and female calf are produced at the same time. The male animal is perfect in all respects; but the female, which is denominated a *free martin*, is incapable of propagating her species; it does not vary very materially, in point of form or size, from other neat cattle, though its flesh is erroneously supposed to be greatly superior, with regard to flavour and fineness of the grain.

Some very interesting experiments, respecting the periods of gestation in different animals, were made a few years ago by M. Teissier, of the Society for the Encouragement of Arts, at Paris; from which it appears, that out of 575 cows,

21	calved between the	240th	and 270th	day; mean term	259½
544	....	270th	.. 299th	....	282
10	....	299th	.. 321st	....	303

Thus, between the shortest and the longest gestation there was a difference of eighty-one days, which is more than one fourth of the mean duration.

As cows are very subject to *abortion*, when improperly treated during gestation, they ought to be observed with more than ordinary care through the whole of that period, lest they should leap ditches, &c., and on no account should they be suffered to draw in the plough or other carriage, which is the practice in some countries. For about a month or six weeks before the time of calving, it will be advisable to turn the cow into sweet grass, if in the spring; or if it happen in the winter, she should be fed with the best hay, where that can be conveniently supplied; in which case she will yield a larger quantity of milk than if she had been provided with that food for a longer time, because the fatter a cow is, the less milk is given; and yet, if it be too poor, there is danger lest she should fall in calving. Or she may be taken into the cow-house from the field, or straw-yard, and baited twice a day with green food, consisting of the hearts of cabbages, their decayed leaves being plucked off and given to lean cattle; turnips, potatoes, carrots, or other winter fodder, or with a mixture of bran and oat or bean meal, to which grains may sometimes be added; care being taken, in such case, to increase the quantity of meal.

When the term of gestation is nearly complete, the animal should be kept apart from other cattle, in a quiet close, near the homestead, in order that she should be under constant observation, and that assistance may be ready in case of a difficult birth; and, as the final period approaches, attention should be paid to keep her bowels open, by means of laxative drinks. If the cow should be so much exhausted in calving, as that the throes are not sufficient to produce the birth, she should occasionally have a drink of two or three quarts of gruel, and a pint of ale, which will give her strength to make further efforts to get rid of the calf, and will also assist the operation. Cows generally calve in a recumbent posture, and care should be taken that the place where they lie down is not on a steep descent; for in that case, the calf is apt to be brought prematurely forward, and, by the straining and irritation it produces, a tedious, and sometimes dangerous calving is occasioned. But, on the contrary, when the act of calving has actually commenced, the operation is aided by the animal being laid on a descent.

The day and night after a cow has calved, she should be kept in the house, and be allowed tepid or lukewarm water only for

her drink. On the day following, she may be turned out about noon, and be regularly taken in during the night, for three or four successive days. The animals thus housed should be kept till the morning cold is dispersed, previously to their being turned into the field, otherwise a premature exposure to the damp atmosphere cannot fail of greatly weakening them.

The hints above stated are given on the supposition that the cow is well, no difficulty having happened during the time of calving; and that she has not *slipped*, or *cast her calf* before its full time. It should be observed, that the proper position of a calf, while in the uterus, is with its fore-feet and head foremost, its back being towards the cow's back, and its two fore-feet lying parallel to the sides of its head. Where the fœtus appears in any other manner, it is termed an *unnatural position;* and the extraction of the calf, under these circumstances, requires the utmost steadiness and dexterity; as, however, no instructions can be adequate to every possible case, it will always be necessary where this event is apprehended, immediately to apply to some expert cow-doctor, lest the loss of a valuable animal should be the consequence of injudicious treatment. During this painful operation, particular attention should be given that the pudendum, or *baron*, as it is sometimes called, be not lacerated or torn; should this, however, take place, the part must be sewed gently up; and, if it be swollen, it ought to be washed with lukewarm milk and water.

But, where a cow slips, or casts her calf prematurely, she must be tended with great care; and, whatever may be the cause, whether abusive treatment, violent exercise, bruises or blows, or that unnatural appetite known by the name of *longing*, every animal that has slipped her calf should be carefully separated from the rest of the herd *. Cleanliness, which is an essential requisite in the general management of cattle, ought in this instance to be an object of special attention;

* This latter direction should be scrupulously attended to; for, however extraordinary it may appear, repeated experience has proved that the disease is infectious. Various reasons have been assigned, but none satisfactorily account for it; though it appears to be occasioned by some peculiar odour issuing from cows which are thus affected: the fact, however, having been ascertained, should be guarded against. It is also worthy of remark, that cows which have once slipped a calf are more liable than others to a recurrence of miscarriage.

and, as cows which are liable to drop their calves usually evince some preparatory symptoms between the cause of the abortion and the actual slipping of the fœtus, it will not be altogether useless to bleed them two or three times, as this expedient has sometimes operated as a preventive.

After, however, the calf is produced, it will be necessary to assist the natural functions of the animal, in order to carry off the *secundines* *, provided in the uterus for nourishing the fœtus; and which, continuing there, in consequence of abortion, would become putrescent, and thus occasion a disagreeable odour that would quickly communicate an infection among other breeding cows. For this purpose we would, at all times, recommend the following mixture to be given to the cow, as soon after calving as possible: Let about three quarts of water simmer over the fire; and, when warm, strew in as much oatmeal as will be sufficient to make a strong gruel, carefully stirring the whole till it boils, that no lumps may arise; then add one quart of ale (or two of table beer) and one pound of treacle, and carefully incorporate the different ingredients by stirring. This mixture should be given lukewarm: it is peculiarly grateful to cows, which will drink it eagerly, after the first hornful, and are thus prevented from taking cold; and, as it is of importance to regulate the state of the body, this object may be effected by giving a warm bran mash; but this treatment only applies to animals that are housed.

Further, it will be necessary to milk the cows, especially if they be full of flesh and the udder hard, three or four times a day, for two or three days, and the calf should be suffered to suck as frequently, if in the house; or, in the field, to run with her, and suck at pleasure; care being taken to observe that the mother does not prevent it; for, if the udder or teats be sore, she will naturally be averse to suckling, and danger is incurred of losing both animals: and, in case the kernel of the udder is hard, the hardness may be removed by rubbing it three or four times in the day.

* Or after-birth, sometimes termed the *cleansing*. Cows will often eat this excrement with avidity; and, to prevent that, it is generally removed: but it is to be doubted whether this practice is judicious, for nature seems to have provided this substance as a medicine for the animal, which may be requisite at the time, and its being eaten is never known to be prejudicial to its health.

The falling down of the calf-bed is a serious accident, which sometimes occurs after a laborious birth, when the cow is more than usually fatigued, although some beasts are naturally disposed to such weakness. Where the falling down of the calf-bed is apprehended, the cow ought to be carefully watched; and the placenta, or cleansing, should be removed, if possible, without effusion of blood; after which the operator may gently replace the calf-bed, taking care not to withdraw his hand till the former begins to feel warm. The following draught may then be given: let bay-berries, pulverized gentian-root, and coriander seeds, of each one ounce; aniseeds and juniper berries, of each two ounces; and half a pound of treacle, be given in three pints of good strong beer; after which lead the cow gently down a hill, if there be one adjacent, as the motion will greatly contribute to replacing the calf-bed in its proper position, and render the application of stays to the womb unnecessary. Where beasts have a peculiar construction, favouring this malady, it may possibly be prevented when the period of gestation is nearly expired, by extending their stalls so as to favour their lying down; but where the calf-bed comes down, and no immediate aid can be procured, it should be deposited on and covered with a clean linen sheet; the irritation thereby produced being considerably less than that of the air, litter, &c.; and when it is replaced, those parts which have been so exposed should be bathed with new milk and brandy, rum, or spirit of wine, after which the treatment above mentioned may be pursued.

After calving, the cow should not be permitted to take the bull until four or five weeks have elapsed, although she should shew symptoms of coition sooner—as the womb is before that time, in so relaxed a state as seldom to admit of conception *.

* See Skellett on the Parturition of the Cow; which contains much valuable information on the subject of difficult births.

CHAPTER VI.

ON THE TREATMENT AND REARING OF CALVES.

THE importance of forwarding calves to maturity with the greatest possible advantage to the full developement of their natural qualities, has necessarily called forth all the ingenuity of the most expert breeders. The most approved, and certainly the best general plan, is to adhere as closely as possible to nature; but various modes of treatment having been adopted in different counties, we shall endeavour to bring into one view every useful fact connected with this subject.

After the calf is produced, the cow uniformly shows an inclination to clean its skin, by licking off, with her tongue, the slimy matter adhering to the young animal. To facilitate this object, it is a frequent practice to throw a handful of common salt over the calf, or to rub a little brandy on it, in case she should disown it, which will cause the dam speedily to perform this necessary duty; and, about an hour after the birth, half a pint of lukewarm gruel is commonly given to the calf, in order to prevent it from taking cold, in lieu of the *beestings*, or first milk drawn from the cow. But however commendable may be the practice of administering gruel—and its use, for the purpose recommended, is not meant to be denied—it should yet be recollected that the beestings is provided by nature as the first aliment of the newly born animal; that it is a strong and viscid fluid of a peculiarly nourishing quality, and therefore appears as if intended for the very purpose of early invigoration. The practice which prevails, of depriving the calf of this nourishment is, therefore, objectionable; nor is there any sound reason why it should not be given, notwithstanding the administration of gruel.

There are two modes of feeding calves:—one is, to permit them to run about with the parent cow the whole of the first year; the other mode is, to wean them when about a fortnight old, and bring them up by hand.

The former expedient is generally allowed to be productive of the best cattle, and is adopted in those counties where fodder is abundant and cheap: in others, where it is found prudent to reserve a portion of the milk, the following plan is pur-

sued. From the time the calves are dropped till they are able to support themselves, they are allowed to run in the manner above mentioned; but they are prevented from sucking by means of a small piece of leather, having little, sharp, iron spikes fixed upon the outside, which is tied on the upper part of the calf's nose in such a manner as to allow it to feed upon the grass without restraint. Hence, as often as the animal attempts to suck, this instrument pricks the cow, and prevents her from letting the milk flow till the arrival of the milk-maid, who removes the muzzle; so that while she strips two of the teats, the calf sucks the other two; and after the process of milking is completed, the muzzle is replaced on the calf's nose in the manner above mentioned.

Whether calves are designed to be raised for breed, labour, or feeding, care should be taken that they have a sufficient supply of good pasture; because, if the latter be scanty at first, they rarely, if ever, attain to large growth. And it may be considered as a general rule, that those calves which are dropped in October or November are best calculated for increase; as the cow's milk is, at that time, not so well adapted to the purpose of the dairy, while the animal is less susceptible of distempers, and will thrive greatly by the nourishing pastures into which it may be turned in the ensuing spring.

Various plans have been suggested, and tried with considerable success, for rearing calves without any, or at least with a small quantity of milk. The time of weaning them varies, from one fortnight till they are seven weeks old; but the latter period is preferable, on account of the weak and tender state of the calves, if separated from the dam at an earlier age. In several counties of England, calves, on being taken from the cows, are, with great pains, taught to drink * skimmed milk, in a lukewarm

* Of the patience and attention requisite in teaching calves to drink, a very inadequate idea only can be formed by those who have never witnessed this tedious process. When the animal has fasted two or three hours, the first and second finger of the right hand, being previously well cleaned, are presented to its mouth; of these it readily takes hold, sucking very eagerly. In the mean time, a vessel of lukewarm milk is placed, and supported by the left hand, under the calf's mouth, and, while it is sucking, the right hand is gradually sunk a little way into the milk, so that it may lap a sufficient quantity without stopping its nostrils, which will necessarily compel it to cease, from want of air. Should, however, either from accident or from too sudden

state; for either extreme of heat or cold is hurtful to the beast, and not unfrequently produces fatal consequences; about twelve weeks after which, for three or four weeks, they are fed with lukewarm milk and water. Small wisps of fine hay are then placed within their reach, in order to induce them to eat. Towards the end of May they are turned out to grass, being taken in a few nights, when they have tepid milk and water given them; which is usually continued, though gradually in smaller proportions, during the last month, till they are able to feed themselves, when they totally disregard it: care, however, should be taken that the grass is short and sweet, and by no means rank or sour. Indeed, a spirited American agriculturist * is of opinion, that calves taken from the cows are much better in a pasture without water than in a pasture of equal goodness with water. The reason he assigns, (with which, however, we can by no means coincide,) is, that, when indulged with water, they drink too much to supply the want of milk; whereas, when deprived of water, they are forced to eat grass, containing some moisture, and soon learn to allay their thirst, by eating before the dew is dissipated, and on that account eat more than if they could go to water. In the county of Suffolk, calves are usually weaned soon after Christmas; when they are fed with lukewarm skimmed milk and water, having bran or oats in it, and some very sweet hay by them, till the grass is ready; though if the farmer have carrots, these form an excellent article of food, and render the use of oats unnecessary. About two gallons of milk daily are sufficient for the support of a calf until he begins to eat. It should be given regularly at the same hours; and he should be kept as quiet as possible, as rest is found to materially promote his growth.

Another mode of rearing calves has been suggested by his Grace the late Duke of Northumberland, the design of which is to render the use of new milk unnecessary, while the expense is reduced in the proportion of two-thirds. It is effected in the following manner: let half an ounce of common treacle be well mixed with a pint of skimmed milk, then gradually add one

precipitation of the hand into the milk, the calf let go its hold, the attempt must be repeatedly renewed till it is crowned with success.

* Mr. E. L. Hommedieu. Transactions of the Agricultural Society of New York.

ounce of finely powdered lintseed oil-cake, stirring it till the mixture be properly incorporated, after which it is to be added to the remainder of a gallon of milk; and the whole, being made nearly of the temperature of new milk, may then be given to the animal; after a short time, the quantity of pulverized oil-cake may be increased. This method is said to have been advantageously adopted; but Lord Egremont has used lintseed jelly, in the proportion of one pint to a gallon of skimmed milk, without treacle, and it did not answer *.

An infusion of hay, called indiscriminately hay-tea or hay-water, has been also applied to the purpose of rearing calves with the smallest quantity of milk. In order to make this infusion, such a portion of fine, sweet hay, cut once or twice, is put into a small earthen vessel, as will fill it, on being lightly settled with the hand. The vessel is then filled with boiling water, and carefully closed; at the end of two hours a brown, rich, and sweet infusion will be produced, not unlike alewort, or strong tea, which will remain good for two days, even during summer, and which is to be used in the following manner.

At the end of three or four days after a calf has been dropped, and the first passages have been cleansed, as already noticed, let the quantity usually allotted for a meal be mixed, consisting, for a few days, of three parts of milk, and one part of the hay-tea; afterwards the proportions of each may be equal; then composed of two-thirds of hay-water and one of milk; and, at length, one-fourth part of milk will be sufficient. This preparation (the inventor of which was, many years since, honoured with a gold medal by the Dublin Society of Arts) is usually given to the calf, in a luke-warm state, in the morning and evening; each meal consisting of about three quarts at first, but gradually increasing to four quarts by the end of the month. During the second month, beside the usual quantity given at each meal, (composed of three parts of the infusion, and one part of milk,) a small wisp or bundle of hay is to be laid before the calf, which will gradually come to eat it; but, if the weather be favourable, as in the month of May, the beast may be turned out to graze in a fine, sweet pasture, well sheltered from the winds and sun. This diet may be continued till towards the latter end of the third month, when, if the animal graze heartily, each meal may

* See the Agricultural Survey of Sussex, p. 262.

be reduced to less than a quart of milk with hay-water; or skimmed milk, or fresh butter-milk, may be substituted for new milk. At the expiration of the third month, the animal will scarcely require to be fed by hand; though, if this should still be necessary, one quart of the infusion (which during the summer need not be warmed) will be sufficient for a day.

The economical mode above detailed has been adopted in some counties of England, with the addition of lintseed-cake finely pulverized and boiled in the hay-tea *only*, to the consistence of a jelly, without employing any milk in the mixture*; and, as so many excellent artificial grasses are now cultivated for the feeding and fattening of cattle, we conceive that an infusion of any one or more of them would be found more nutritious than if it were prepared from the promiscuous mixtures of grass usually occurring in common hay.

In the northern counties of England, it is a common practice to give the calves equal parts of milk and sweet whey, made luke-warm; but, as this mode often produces scouring, or looseness, we think the following method, which was a few years since communicated to the public by a spirited and experienced breeder, is greatly preferable. For the first four or five weeks he fed them regularly, but oftener than is usually done, with new and skimmed milk; at the end of which time his calves were gradually taught to drink strong water gruel, consisting of equal parts of bean or oat-meal, mixed with one-half of butter-milk, and carefully mixed with the gruel after the latter is removed from the fire. This method of treatment he is stated to have pursued with great success for many years; his calves being strong and healthy, while every thing that could tend to retard their growth was effectually prevented.

* In the "Letters and Papers of the Bath and West of England Society," Vol. V. we have a singular instance of success in this mode of rearing, by Mr. Crook. In 1787, he bought three sacks of lintseed, value 2*l.* 5*s.*, which lasted him three years. One quart of seed was boiled in six quarts of water, for ten minutes, to a jelly, which was given to the calves three times in the course of the day, mixed with a little hay-tea. Thus he was enabled to rear in 1787, seventeen calves; in 1788, twenty-three; and, in 1789, fifteen, without any milk at all. And he states, that his calves throve much better than those belonging to his neighbours which were reared with milk. Pot-liquor has also been found an excellent substitute for milk; and it is remarkable, that the great ox bred by Mr. Dunhill (already mentioned in the Introductory View) was chiefly reared on it.

The following mode of rearing these animals prevails chiefly in the vicinity of Abbey-Holme, in the county of Cumberland, where the calves are remarkable for their size, fatness, and fine white colour; before, however, we detail the practice of the breeders of that place, it will be necessary to remark, that their stock is of various ages, in order that their plan may be carried on without interruption. For the first two or three weeks, the young calves are fed in the common way; and, at the end of that time, are conducted to a feeding-shed. Here two small stakes are driven into the ground for every calf, at the distance of ten inches or a foot from each other; the head of the animal is then put through the intermediate space, a strap or cord being passed round its head, on either side of which there is a ring, which surrounds the stake. By means of this contrivance the calf is prevented from licking itself, which habit would materially affect its health and growth, while it is not so confined as to be hindered from lying down or rising at pleasure. When the calf is reconciled to its new habitation, the Abbey-Holme farmers supply it with better food than it has been accustomed to receive. Rightly judging that the latter part of a cow's milk is more nourishing, and of a richer quality than that which is first drawn, they divide the milk according to the respective ages of the animals; invariably giving the richest part to the oldest calves: so that, as the milk may lessen or improve in quantity or quality, they can, at all times, regulate their stock by diminishing or augmenting their numbers. Another circumstance peculiar to that district is, the regulation of the temperature of the feeding-sheds according to the alteration of the different seasons, so as to keep them, as nearly as possible, always at the same degree of heat *. Cleanliness is also an object of rigorous attention, the place being kept constantly dried, and supplied with a proper quantity of good litter; and, on this subject, it should be observed, that oat-straw has been found to render them lousy. In case any of the animals' appetites fail, so that they do not regularly take their food, they are im-

* This practice cannot be too strongly recommended. Warmth is, indeed, well known to be essential to the health, and particularly to the improvement in flesh, of all animals; but sufficient attention is not generally paid to the maintenance of an *equal temperature*; though, next to proper shelter, it is the point of greatest importance.

mediately consigned to the butcher, and their place is occupied by the next in age.

In the county of Norfolk, calves are fed with skimmed milk, in which is mixed a little wheaten flour; they have also chopped turnips in a trough, and some hay in a low rack. As soon as these animals learn to eat turnips freely, they are no longer supplied with milk, those roots, with the addition of a little hay, furnishing them both with food and drink. The period of raising calves in the above-mentioned county is from Michaelmas to Candlemas; but the time of feeding them wholly with turnips varies, according to circumstances or accident. Where there are older calves that have been accustomed to these roots, the younger ones soon acquire the method of breaking and eating them, by picking up the fragments left by the former.

Towards the month of March, those which are first reared, are turned out among the fattening bullocks during the day, and are sheltered in the night; though, if the weather prove favourable, they are in a few days turned out altogether. In the succeeding summer they are kept in clover, or other luxuriant grasses, and, the following autumn, are sufficiently strong to stand in the straw or fold-yard. This circumstance is considered as a chief advantage to be derived from rearing calves early in the season; as those which are raised during the spring require two years' nursing.

In Holland, we are informed that the calves are reared in long and narrow, but tolerably lofty, suckling houses. The pen in which the calf is kept is so narrow, that it cannot turn round, so that it can only go backwards to the end of the pen, which is also short, and forwards to the door: the house is kept in total darkness, and the pen kept perfectly clean and sweet. When the suckler comes to administer the milk, a small hole is opened, sufficiently big to admit its head to be thrust out, and which is made in the door-way; as soon as the animal perceives the light, it advances towards it, pushes out its head, which the suckler puts into the milk pail; and, being taught to drink the milk, it very soon gets fat, and much quicker than by either of our modes, where the calf is usually tied up, or is permitted to run about in an open place. The Dutch farmers hang up a piece of chalk near the door, for the animal to lick; and when the calf is about to be removed, the

pen is so contrived, as to height, that, when the door of the suckling-house is open, it falls down on the tail of the cart, and the animal walks into it, and is secured. The floor of the Dutch calf-pens is of lattice work, so that it always lies dry *.

The subsequent method of raising calves, by Mr. William Budd, of Boston, in America, which obtained the prize from the Agricultural Society of Massachusetts, we give in his own language, extracted from his communication to that Society.

"Take the calves, when three days old, from the cows, and put them into a stable by themselves; feed them with gruel, composed of one-third barley, two-thirds oats, ground together very fine, sifting the mixture. Each calf is to receive a quart of gruel morning and evening, and to be made in the following manner: to one quart of the flour add twelve of water, boil the mixture half an hour, let it stand until milk-warm. In ten days, tie up a bundle of soft hay in the middle of the stable, which they will eat by degrees. A little of the flour, put into a small trough, for them occasionally to lick, is of service. Feed them thus till they are two months' old, increasing the quantity. Three bushels of the above mixture will raise six calves."

Mr. Clift, of the New York Agricultural Society, takes the calf from the cow at two or three days' old; he then milks the cow, and while the milk is warm, teaches the animal to drink by holding his head down into the pail; if the calf will not drink, he puts his hand into the milk, and a finger into the mouth, till the beast learns to drink without the finger. After he has been fed with new milk for a fortnight, the cream is taken off the milk, with which an equal or larger portion of thin flax-seed jelly is mixed, and the whole is given milk-warm. Thus, as the spring is the most favourable season for making butter, he is enabled, during the six or seven weeks the animals are kept previously to weaning, to make as much butter as they are worth; a practice which merits the attention of our English farmers, to whom it will afford a very essential saving,

* Malcolm's "Compendium of Modern Husbandry," Vol. I, p. 354. The practice is admirably adapted for fatting calves for the butcher; for which quietude is absolutely requisite: but where the object in rearing them is to keep them, as stock, it probably will be found more conducive to their health to turn them out into a sheltered paddock or yard, only housing them at night.

particularly in those counties where butter forms a chief article of manufacture.

In the rearing of calves, much, however, depends on the regularity of feeding them; the common practice is, to supply them with food twice in the day, in the morning and at evening, when they generally receive as large a quantity as their craving appetites can take. Hence the digestive organs are necessarily impaired, and numerous animals either become tainted with disease, or perish from the inattention of their keepers; whereas, by feeding them thrice in the day, at equidistant intervals, and allowing sufficient room for exercise, (when they are not intended to be fattened,) they will not only be preserved in health, but they will also greatly improve in condition.

Veal being a favourite article of diet, the fattening of calves is an object of no small importance, particularly in the vicinity of the metropolis. Hence various sorts of food and modes of treatment have been recommended; but the most effectual, and consequently the best way, is to keep them in pretty dark places, in coops, (lest they should fatigue themselves by sporting too much in the light, which would be injurious to them,) and to feed solely on the cow's milk, with the addition of a little meal, for the last few weeks. It is also a common, and not an injudicious practice, to give them about a wine glass full of common gin or rum, mixed up in as much flour as it will moisten, in the intermediate time between their being suckled: it is made into balls, and forced down the throat; and on this treatment the animal will generally become sufficiently fat in from ten to twelve weeks: it is not desirable to keep them a day beyond the time when they are fit for the butcher, as small veal is preferred to large, if equally fat. Further, as cleanliness is an indispensable object in fattening cattle, it should, in the present case, be particularly attended to; for this purpose, the coops ought to be elevated at such a height from the ground that the urine may pass freely off; fresh litter should be supplied every day, in order that they may lie dry and clean; and a large chalk-stone should be suspended over the coop, so that the calves can easily lick it*. It is also a common practice to bleed them when they

* Chalk is commonly supposed to assist in whitening the flesh: that idea is probably erroneous; but it has an essentially salutary effect, in correcting the acidity of the stomach, to which calves are very liable, and thus preventing the consequent scouring.

are four or five weeks old, and again a little time before they are killed, by which contrivance the whiteness of their flesh is greatly increased: the quantity of blood taken is about two quarts, or more, according to the age and strength of the calf. The operation of bleeding is, therefore, frequently repeated by some persons, though it does not appear to be altogether necessary; as the most experienced breeders are of opinion, that it is sufficient to bleed them twice, drawing from them such a quantity at each time as their age and size will allow, without hazard of destroying the animal.

With regard to those calves which are intended for the draught, it will be advisable to accustom them, while young, to be handled and stroked, and tied up to the manger; as they may, when they come to be broke, be handled with less apprehension of danger.

The best time for castrating male, or spaying female calves, undoubtedly is when they are fifteen or twenty days old, as at that time there is least danger, provided they be in full health; though this operation is in some places, particularly in Scotland, deferred till the animals are three years old. Formerly this object was effected by tying a strong cord round the small part of the testicles, near the body, till these became completely dead, when they were either suffered to remain till they dropped spontaneously off, or were cut off, and the animal was perfectly castrated. Modern ingenuity, however, has devised a better means of eradicating the testicles, by excision; but, as this cannot be effected without resorting to an experienced farrier, or cow-doctor, we decline to give any directions respecting an operation which, if unskilfully performed, must prove greatly injurious to the animal. Let it, therefore, suffice to state, that, after the calves are castrated, or spayed, as the difference of sex may require, great care ought to be taken that the wounded part be not exposed to the air, which might otherwise occasion loss of blood or other accidents. For the first two or three days, the animals should be kept quiet and tolerably warm, and be dieted according to their weakness; but they ought not to be allowed too much drink till they are perfectly recovered, after which time they may be treated in the usual manner.

CHAPTER VII.

OF STEERS AND DRAUGHT OXEN.

THE ox is an animal of no small utility for various purposes of draught. The most valuable breeds for working are those of Devonshire, Sussex, and Herefordshire, together with the oxen reared in the counties of Somerset, and Glamorgan, whose breed is said to be even superior to that of Devonshire. As the distinctive characters of these breeds have already been specified in our Introduction, we now proceed to state the principal objects requisite to be attended to in these animals; after which the most advantageous methods of working them, together with a comparative view of the merits or demerits of oxen and of horses, will present themselves for discussion *.

A good ox for the plough should be neither too fat nor too lean; as, in the former case, he will be too lazy; and in the latter, he will be too weak and unfit for labour. His body ought to be full, joints short, legs strong, eyes full, his coat smooth and fine, (which latter circumstance is a certain indication of good health,) and every part symmetrical, or well put together, so that his strength may be easily seen. Another requisite is, that he answer to the goad, and be obedient to the voice; but this animal can only be brought willingly to bear the yoke, or be easily governed by gradual and gentle treatment. Those calves which are designed for the yoke, should not be broken earlier than two and a half, or three years, lest they be overstrained †; nor should that operation be deferred longer, as they will become froward, and too stubborn to submit to the yoke. His work should then be so proportioned as not to affect his growth, which continues until about his seventh year; for if this be not attended to, his value will be lessened in a greater degree than will be compensated by his labour.

The strength of this animal, when properly trained and managed, is very great, and he has patience to endure fatigue; but, being naturally slow, he must not be exerted beyond his usual pace. The only method by which success can be attained

* See Book II. Chap. VII.

† In Devonshire, however, they are frequently put to gentle work at two years of age.

is, by patience, mildness, and even by caresses; for compulsion and ill-treatment will irritate and disgust him. Hence, great assistance will be derived from gently stroking the animal along the back, by patting him, and encouraging him with the voice, and occasionally feeding him with such aliments as are most grateful to his palate. It will also be proper to tie his horns frequently, and after a few days to put a yoke upon his neck, when he should be fastened to a plough with a tame old ox, of equal size; next, the oxen should be employed in some light work, which they may be suffered to perform easily and slowly; thus they will draw equally, and the young steer will be gradually inured to work. After working in this manner, he should be yoked with an ox of greater spirit and agility, in order that the steer may learn to quicken his pace; and, by thus frequently changing his companions, as occasion may allow, he will, in the course of the first month or six weeks of his labour, be capable of drawing with the briskest of the stock.

After a steer is thus properly broken, it will be advisable, for the future, to match such as are intended to draw in the same team, or yoke; attention being paid to their size, strength, and spirit or temper; otherwise, by being unequally matched, they will not only spoil their work, and be greatly disqualified for draught, but the slower or weaker animal of the two being urged beyond its natural powers, will inevitably receive material injury.

Another circumstance of essential importance in breaking-in young oxen is, that, when first put to work, whether at the plough or in teams for draught, they be not fatigued, or overheated. Till they are thoroughly trained, therefore, it will be necessary to employ them in labour only at short intervals; to indulge them with rest during the noon-day heats of summer, and to feed them with good hay, which, in this case, is preferable to grass. In fact, while oxen are worked, they must be kept in good condition and spirits, by moderate, but wholesome sustenance. Further, on their return home from labour, it will greatly contribute to preserve their health, if their feet be well washed previously to leading them into their stalls; otherwise diseases might be generated by the filth adhering to them; while their hoofs becoming soft and tender, would necessarily disable them from working on hard or stony soils. The extremes of heat and cold ought also to be carefully guarded against, as

disorders not unfrequently arise from excess of either temperature; and they are peculiarly exposed to fevers and the flux, if chased, or hurried, especially in hot weather.

The following mode of training and working oxen, which has been successfully adopted in North Britain, we give in the words of the farmer by whom it is practised.

"Out of my stock of cattle," says he, "I select, when two years old, (that is, after harvest, when they are rising three,) four of my stoutest, best-shaped *stots* from the field. These, to accustom with harness, I bind up in my oxen byre every night, for a week or two; and they are then taken out in pairs, and put into the plough with a pair of older-trained oxen yoked before them. This keeps them steady, and prevents their running off. After being yoked in this manner two or three times, I turn them again amongst the cattle in the straw-yard, where they remain until spring. They are then three years old. I yoke them all four, after training them as above stated, in a plough by themselves, which requires a little boy to drive; and in that way they are used until four years old, when they are worked in pairs as horses, by one man only, and do the same work at ploughing; for at carting, &c., I never use them, having as many horses as do that part of my work. When used in pairs, one man works two yokings, and the cattle only one each. If, however, I had occasion for two cattle-ploughs, each pair might work very well two yokings, the same as horses."

The same intelligent correspondent also remarks, in addition to the above: "if, when three years old, eight *stots* were worked, four and four *alternately*, it would be a great relief; and I have uniformly found that cattle *moderately worked* thrive better than those that are idle, or unemployed." *

The following system of a succession of breeding and working cattle has been recommended by that eminent agriculturist Mr. Ellman, of Glynde, in Sussex:—the numbers depending, of course, on the means or inclination of the breeder:—

14 calves; of which, nine male; eight for oxen, and one allowed for accident, or not taking to work.

14 year-olds.

* Farmer's Magazine, Vol. III. p. 450.

14 two year olds; of which eight worked a little at two years and a half.

14 three year olds; part of which taken for cows, and others, if not good, fattened.

14 four year olds; eight worked.

14 five year olds; do.

14 six year olds; fattened.

Thus twenty-four oxen are worked in common; eight, three; eight, four; and eight, five years old; and a reserve is kept for breeding cows, and accidents *.

The details of the Earl of Egremont's system, as followed to a great extent at Petworth, are as follows:—

The calves are dropped from December to the end of February; they are weaned immediately, never letting them suck at all, but the milk given for a few days as it comes from the cow. But for weaning on skim milk, they ought to fall in December, or a month before and after, and should then be kept warm by housing; and thus they will be equally forward with calves, dropt late in the spring, that ran with the cow. With the skim milk some oatmeal is given, but not till two months' old, and then only because the number of calves are too great for the quantity of milk; water and oatmeal are therefore mixed with it to make it go farther. But to this, heifers with their first calves are exceptions: for they do not become good milkers if their calves are not allowed to suck for the whole season; with the second they are treated like the rest. In May the calves are turned to grass; the first winter, from the beginning of November, they are fed upon rouen, or, as it is in some places called, aftermath. The following summer they are at grass; the second winter on straw, with a turn on short rough grass: they have been tried on hay alone, but straw and grass do better. The following and every other summer on grass, and are broke at Christmas, being then three years' old, but are only lightly worked until the spring, when their real labour begins. From this time their winter food is straw, with a ton and a half of clover hay from the beginning of January. They are previously kept on straw alone, yet are worked three days in each week.

* See Agricultural Survey of Sussex, p. 261.

Ox Yokes.

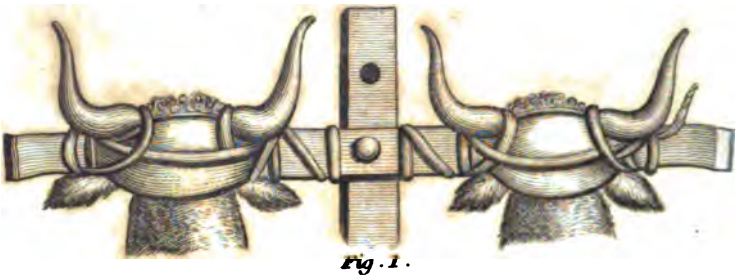


Fig. 1.

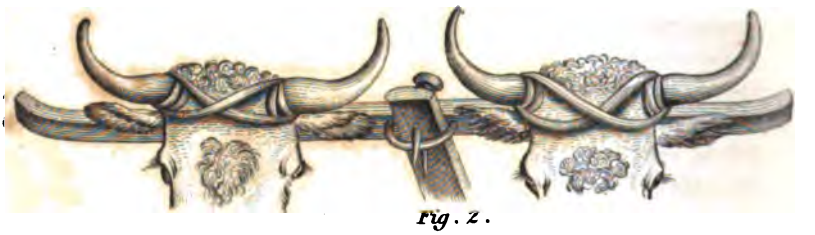


Fig. 2.

Carts

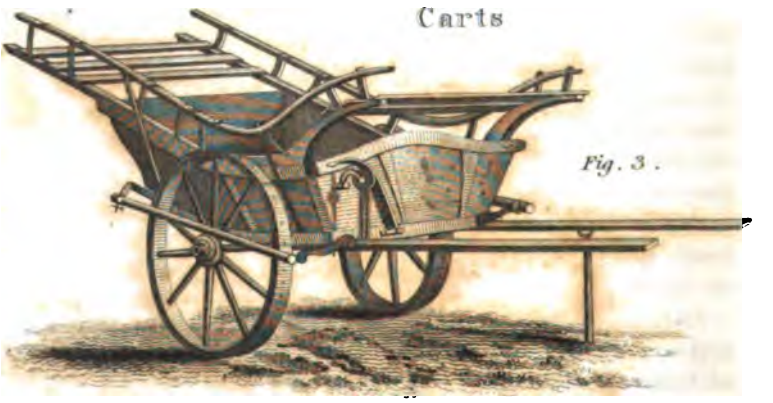


Fig. 3.

Front View of Lord Somerville's Drag Cart.

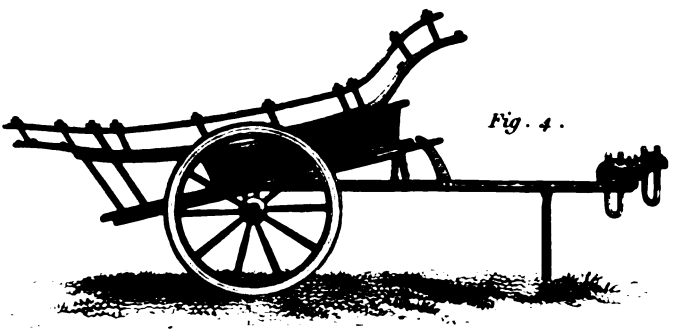


Fig. 4.

Side View of the same Implement.

The breed is Hereford, Sussex, Devon, and a mixed breed between Hereford and Sussex. The Herefords are the best, when pure, for the combined objects of working and fatting; but the mixture of half Hereford and half Sussex are nearly equal *.

The general character of the ox is, patience and tractability, though young steers sometimes prove refractory and vicious; which, however, is in most instances the result of defective management, or of bad treatment when first *broken* for the yoke. When, therefore, an ox is unruly or stubborn, it will be advisable to keep him till he is hungry; and, when he has fasted long enough, he must be made to feed out of the hand. On his returning to labour, he should be tied with a rope; and, if he at any time become refractory, gentle measures should be adopted, as above described, in order to bring him to work readily and quietly.

In working oxen to advantage, much depends on the mode of harnessing them, and upon what has been termed the *principle of draught*. This principle, as Lord Somerville has judiciously remarked †, depends on the joint power of the neck and base of the horn. In Portugal, these animals are harnessed in the following manner: a long leather strap is wrapped round the yoke, whence it passes round the lower part of the horns, and is again fastened to the yoke. By this contrivance, the heads of the oxen become more steady while performing their work, and these useful animals are rendered more tractable.

In France, and in the Peninsula, oxen are worked by *the head*, and are yoked in a manner which is better expressed by the aid of figures than by description. Plate 1, figure 1, therefore, represents a view of the hinder part of the head and neck of these animals in the yoke, as they appear to a spectator; and figure 2 exhibits a front view of the upper part of their heads, in order to convey a more accurate idea of the mode in which the French oxen are fastened to the bow; this method being, in the opinion of the noble agriculturist above mentioned, the

* Sussex Agricultural Survey, p. 263.

† "The System followed, during the two last years, by the Board of Agriculture, &c." 8vo, second edition, 1800.

best preparatory step towards introducing the Portuguese manner*.

The question, "whether it is most advantageous to yoke oxen by the head or by the collar?" has occasioned much discussion, and is even yet undetermined. The prejudice throughout Great Britain is, generally speaking, decidedly in favour of the collar; but throughout Spain and Portugal, where oxen are the only animals employed in agricultural labour, whether of road or field draught, they are invariably yoked by the head. The strength of the animal, indeed, lies in his neck; of the power of which, the yoke affords him all the advantage; while the collar deprives him of it, as he does not draw by the shoulders. The far greater cost and trouble of harness, than of yokes and bows, are also considerations of moment; and in summer, harness has been found an incumbrance, the ox requiring all the relief and liberty that can be given in hot weather.

The advocates for the collar insist upon the advantages of single-ox-carts; and of ploughing with the team at length, by which, as they walk in the furrow, the land is not so much subject to be poached as when they are yoked abreast. They affirm, also, that the pace is quicker in harness; and that the animal works with greater ease. But their opponents allege, that oxen are more advantageously worked in couples than singly; inasmuch as that, being nearer to the draught, they possess greater power over it than when drawing at length: they consider the additional expense occasioned by a double number of one-ox-carts and drivers, as more than counterbalanced by any advantage, even if any were admitted, in their use; and they deny that the animal works either quicker or with greater ease.

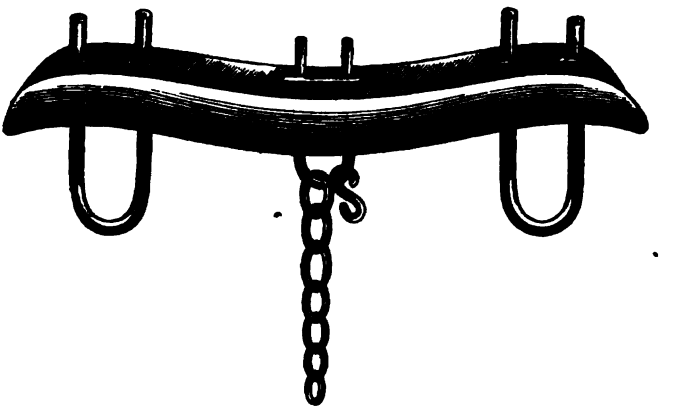
It would be endless to detail the various comparative trials that have been published on this long contested subject; and it may be deemed sufficient to state the result of two, made, some years ago, in Sussex; where, from oxen being extensively used, the dispute has excited more than common interest.

* We understand that the Earl of Shannon introduced this method of yoking oxen into Ireland, with the happiest success; as *two* oxen thus harnessed were enabled, with great ease, to draw the enormous weight of *three* tons.

In order to decide the respective merits of the two methods, it was agreed, that an acre of land should be ploughed by two teams, the one of six oxen in double yokes, the other of four oxen in collars; and then, again, with four oxen in single yokes, against four in collars. In the first trial, the six in yoke beat the four in collar easily; and in the second, there were only three minutes difference. The work was equally well performed; but the ploughing must have been very light, as the last match was completed in four hours and ten minutes *.

So far as this experiment may be considered decisive, it re-established the equality of the teams; but had it been tried by more severe labour, or on hilly ground, it might have proved different; and in steep ascents, more particularly, the yoke would probably have been found best adapted to the animal. It is a prevalent idea in England, that oxen are unfit for draught in hilly countries; but a large portion of the Peninsula is mountainous, and they there draw heavy weights in carts of a very rude construction. Being worked in yokes, they possess the power of preserving the line of draught, by lowering the head according to the inclination of the ground; an advantage which is lost in the application of the collar.

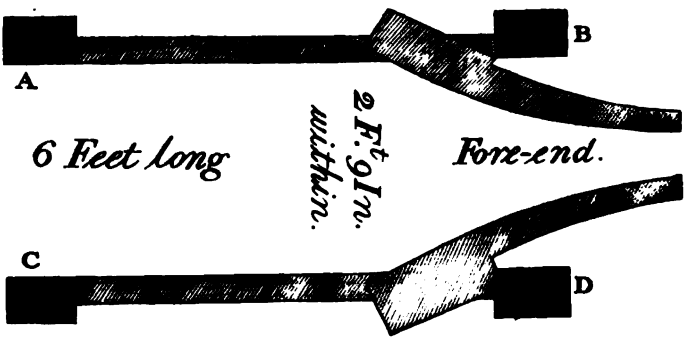
Lord Egremont has also worked his cattle each way, at Petworth, in both road and field labour, and his Lordship's experience confirms the opinion in favour of the old Sussex yoke, of which the following is a figure.



Connected with the subject of draught is another, which

* See Agricultural Survey of Sussex, p. 243.

has only received, of late years, that attention which it required, viz. the *shoeing of oxen;* a necessary operation, which, when carefully executed, will not only conduce to the animal's comfort and health, but also to the farmer's profit; as he will thus be enabled to draw both with greater speed and with superior effect. According to the common practice, the animal is first *cast*, or thrown, and his legs bound together in the usual manner; he is then forced nearly upon his back, and his feet are hoisted up to a convenient height by means of a forked pole, the forked end taking the bandage that binds the feet, while the opposite end is firmly fixed in the sward upon which they are thrown; the farrier then proceeds to affix the shoes in a manner similar to that practised on horses. By this simple contrivance, the operation acquires great firmness, steadiness, and convenience; but it is attended with disadvantage, as accidents sometimes occur in the operation of casting, the other oxen being apt to become unruly on seeing their companions roughly treated, and thus many valuable cattle are often rendered completely useless. To obviate such accidents, an ingenious machine of great simplicity has been long in use at the late Mr. Bakewell's farm at Dishley. It merely consists of four posts A, B, C, D, fixed firmly in the ground with strong side-rails, thus:—



The animal being led in is confined by four broad straps going over the back and under the belly: the two projecting benches are hollowed on the top, for laying on the fore legs one at a time; the hind legs are severally held out, when wanted, by a long wooden lever; and thus the shoes are applied without any possibility of injuring the beast. It has, indeed, been suggested *, (and we

* Marshall's Rural Economy of the West of England, Vol. II. p. 285.

think the plan might be easily carried into effect,) that if calves, intended to be reared for work, were accustomed, while young, to have their feet taken up, and their hoofs beaten with a hammer; and that, if this practice were repeated during the winter, while the steers are in the yards, they might afterwards be shod in the same manner, and with equal facility as horses.

CHAPTER VIII.

OF GRAZING NEAT CATTLE.

THE feeding and fattening of cattle, whether for labour or for sale, is the most important in the whole economy of the grass farm: hence the farmer should previously consider the *nature* and *fertility* of his *pastures*, and the extent and quality of his other resources; and, according to these, he ought to regulate his system of *grazing*, *soiling*, or *stall-feeding*; selecting, in the first instance, those beasts only which evince the most *thriving disposition to fatten with the least consumption of food*, and depasturing them upon such lands as are best calculated for the respective breeds; and especially taking care not to bring cattle from rich to inferior soils, but, wherever it is practicable, to choose them from lands of nearly the same quality as those destined for their reception; beside which precautions, it will be necessary, in all situations which are not provided with wholesome water, to avoid selecting cattle from those districts where that fluid abounds in a state of purity.

The introductory view of breeds prefixed to this work, will probably supply some hints for enabling the farmer to decide what sort of stock is calculated for peculiar situations; in addition to those remarks, we would observe, generally, from the practice of the most eminent graziers, that the larger beasts are preferable for the more luxuriant pastures; while, in such as are less rich, small stock answer best. Thus, a grazier who has fine and fertile pastures may select his beasts as large as he can find them; provided they are of the right sort and shape. But it is requisite, that those who are upon indifferent grass take care to proportion the *size* of their beasts to the *goodness* of their pasture; for it is preferable to have cattle rather too small

than too large, because there are numerous tracts of ground which will be profitable for grazing such cattle, which are not capable of supporting large breeds. Hence we find, that in the rich grazing counties of Lincolnshire, Sussex, &c. large breeds are chosen, with a mixture (in the former county) of Scotch and other cattle, bred in the vicinity. In the counties of Norfolk and Suffolk, the kyloes and galloways are fattened preferably to any other breeds, on account of their superior kindness, and the excellence of their flesh, which uniformly procure a ready sale in the London markets. Next to these, in the esteem of salesmen, is the dark red variety of the Devonshire sort, which chiefly prevails in the counties of Leicester, Oxford, Somerset, and Warwick; to these may be added the Glamorgan, Hereford, and Suffolk polled breeds of cattle, all of which are eminently profitable in particular situations. But, in order to carry on the grazing of cattle with effect, it is necessary that the grazier form a complete plan, or system, and proceed regularly therein, deviating from it in those instances only which obviously tend to improve his course, and ultimately to increase his profits.

With regard to the species of cattle best calculated for grazing, spayed heifers and oxen are certainly superior to any other stock; the former, indeed, are of less frequent occurrence, though they fatten with more expedition. Many graziers consider heifers more kindly in their disposition to feed than steers; particularly when they have already had a calf; and Mr. Honeybourne, the respectable successor of Bakewell, at Dishley, is of opinion that they are superior to oxen for fatting at any age, and that they will produce a greater weight of beef per acre *. Wintering heifers in calf, in some grazing districts termed *in-calvers*, may also be advantageously fattened, if attention be paid to selection, and the beasts are well fed during the winter, on rich succulent crops: they are occasionally sold for small sums at the autumnal or Michaelmas fairs, and may be disposed of in the succeeding spring, with the calves running by their side, to considerable profit. *Free Martins*, or barren cows, have also been tried for the purpose of fattening, but they rarely succeed; this is also the case with old cows, and such as are become dry, which may, in a few instances, prove a source of profit; but as they are for the most part hazardous, and much inferior to

* See the Agricultural Survey of Leicester, p. 232.

young or middle-aged stock, (which are always to be selected, if possible, from their *kindliness to fatten*,) it will be proper that such cows take the bull before they are turned into the pastures; and that they be constantly ready for sale, at least three months before the time of gestation expires.

It has been intimated, that young, middle, or small-sized cattle are preferable for the purpose of grazing; they are certainly best calculated for the gradual mode of grazing, the duration of which varies from a year and a half to two years; and, by the manure they afford, as well as the enlarged price they fetch when sold, they amply repay the expense of their keep. In stocking lands with cattle, the proportion of beasts to be introduced must depend upon the fertility of the soil, as well as upon local custom, and other circumstances. In the counties of Somerset and Devon, one acre, or one acre and a half of the richer kinds of land, are allotted to one ox, to which a sheep is sometimes added: but fertile as those districts are, they are surpassed by the richer grounds of Lincolnshire, the best of which will support one ox and fourteen large sheep on two acres during the whole summer, and five sheep on a similar space of land in the winter, or *sixteen* sheep on one *acre* throughout the summer. And instances have occurred, in which *one hundred and ten* Lincolnshire sheep, and *fifteen* large bullocks of the same breed, have been fattened on *fifteen* acres, the last-mentioned animals having been put to spring grass out of the straw-yard, and fattened to the weight of 1,130 pounds by the ensuing Michaelmas.

In order to graze cattle to advantage, it ought to be a fundamental principle so to stock them that they may feed without restraint; beside which, as often as opportunity or other circumstances will allow, it will be profitable to change them from one pasture to another, beginning with the most inferior grass, and gradually removing them into the best. By this expedient, as cattle delight in variety, they will cull the uppermost or choicest part of the grass, and by filling themselves quickly, as well as by lying down much, they will rapidly advance towards a proper state of fatness; while the grass, which is thus left, may be fed off with labouring cattle, and lastly with sheep. Hence it will be advisable to have several inclosures, well fenced and sheltered, and abundantly supplied with wholesome water. Respecting the best size for such inclosures, there is a differ-

ence of opinion; from ten to fifteen or twenty acres, perhaps, is the most appropriate; though, if any be of a greater extent than this, they may be divided by a strong, but temporary fence for this purpose. Their size, however, should be various, as small ones are preferable in winter, and larger ones during the summer. Thus the greatest and strongest cattle will be separated from the weaker ones; for, if cattle of various sizes are indiscriminately mingled together, the more powerful beasts will master the others, driving them from place to place, and trampling upon or wasting more food than they can eat.

To prevent these inconveniences, and also to stock the land to the greatest advantage, some intelligent graziers recommend the following method of feeding and fattening cattle. Suppose there are four inclosures, one ought to be kept perfectly free from stock till the grass is in its full growth, when the prime, or fattening cattle should be put into it, that they may get the best food; the second best should then follow, and the young stock after all, making the whole feed over the four inclosures in the following succession:

First inclosure. Free from stock, till ready for the best cattle.
Second inclosure. For the reception of the best cattle, till sent to No. 1.
Third inclosure. For the second best cattle, till sent to No. 2.
Fourth inclosure. For the young cattle till sent to No. 3.

Thus the fourth inclosure is kept free from stock till the grass is got up, and it is ready for the prime cattle. To which we will add, that the inclosures should be finally gone over by store sheep; by which they will be eaten down to a close and even sward, to the great benefit of the aftergrowth.

Further: it will be of service to erect *rubbing-posts* in different parts of the various inclosures, where stock are feeding. This practice originated in the county of Norfolk, whence it deserves to be more generally known and adopted, as such posts keep the cattle from the fences, and, as Mr. Marshall observes, "furnish them, no doubt, with an agreeable, and perhaps a salutary amusement." He also remarks, that some Norfolk farmers draw the crown of a tree, with the lower part of the boughs left on it, into the middle of the close; this is less trouble than

putting down a post, and is easily rolled out of the way of the plough, and seems to be still more agreeable to the cattle *.

Before we proceed to discuss the other branches connected with the grazing of cattle, we trust it will not be altogether irrelevant to state a few particulars concerning the peculiar practice, or management of some of the most eminent graziers.

Thus, some farmers purchase *heifers*, and other lean stock, from the month of March or April, to the month of May, and turn them in upon the meadows and pastures as early as possible. Here the beasts became completely fat on the *grass-feed* towards the close of October, or the commencement of November, or even later in the year, according to their *kindliness* of disposition in taking on fat. This mode is very beneficial, particularly with small cattle, as these can be turned into the less fertile lands, which would not afford an adequate supply of food to the larger sorts of beasts. In the county of Middlesex, the method just mentioned is applied with uncommon success, on *luxuriant hay-farms*. The graziers in that county purchase small cattle, which are in pretty good condition, as early in the autumnal quarter as the *rouen latter-math*, or after-grass, is ready; into this the beasts are turned, and are sold to considerable advantage about the end of October, or early in the ensuing month of November.

There is another mode practised in some grazing districts, where the lean stock are purchased at various periods and of different sizes, so that they may be sent to market in April or May, when such beasts are generally sold for considerable sums. According to the plan of these graziers, the cattle are sometimes kept throughout *two* winters, during the first of which they are not at *full keep*, but in the following summer they are turned into good grass, and are fattened off in the second winter with the best and most forcing food the farmer possesses. The more common system, however, consists in buying small cattle as early in the spring as the grass affords a good bite, when they are allowed one summer's grass, and are stall-fattened in the ensuing winter.

With regard to the management of pasture grounds, it may be observed, that those which are *laid*, or allowed to *rest* at Candlemas, may be grazed in the following May; such as are

* Marshall's Rural Economy of Norfolk, vol. ii. p. 115, 2nd Edit.

laid in May, may be grazed at Midsummer; those to which rest is given at that season, may be grazed at Lammas; while such as are laid at Lammas may be grazed in October, and generally throughout the succeeding winter.

In the grazing of cattle, a variety of circumstances will claim the farmer's attention, in order to conduct his business with regularity, or with profit. Hence he ought to take especial care not to turn his stock out into the pastures in the spring, before there is a *full bite*, or the grass has obtained a sufficient degree of length and maturity; for neat cattle, whose tongues chiefly enable them to collect the food, neither can nor will bite near the ground, unless they are compelled by extreme hunger, in which case, it is obvious they cannot enjoy their feed, and consequently cannot thrive in proportion.

Further: where beasts are turned into fields, consisting either of clover entirely, or of a mixture of natural and artificial grasses, great circumspection is required, to see that they do not eat so eagerly, or to such excess, as to become *blown* or *hoven*, an affection to which cows are more peculiarly liable than any other neat cattle. That disorder, however, may be prevented either by feeding the animals so as to gratify the cravings of appetite before they are turned into the pasture, or by constantly moving them about the field for a few hours after they have been turned in, that the first *ball* at least may sink into their maw before the next be deposited. Should they, notwithstanding, be attacked with that dangerous swelling, they may be relieved by adopting the remedies pointed out in Book VI. Chap. II. Sect. 4.

Grass usually attains its acmé of maturity and luxuriance about Midsummer; and from that time to Lammas it posseses a peculiar sweetness, so that stock may be allowed, during the intervening period, to bite somewhat nearer to the ground. It will, however, be necessary to remove fattening cattle, (as already intimated,) from time to time, into fresh grounds; so that by taking the uppermost and choicest part of the grass, they may feed both expeditiously and thoroughly. The grass left behind them may be fed off first with labouring cattle, and afterwards with sheep. This last-mentioned point cannot be too minutely regarded; for, if cattle be in want, they will lose more flesh in one day than they can possibly gain or recover in three. Hence those meadows, or pastures, (particularly such

as lie in fenny or other situations, which retain moisture for a long time,) ought to be fed off as early as possible, lest sudden or long-continued rains descend, which will not only render the juices of the grass thin and watery, and ultimately putrescent, but which will also materially affect the health and constitution of the animals. To prevent the losses consequent on such accidents, it will therefore be indispensably necessary, daily and attentively to inspect the grazing stock; and if any beasts appear to be affected by eating wet grass, they should be immediately conducted into dry shelters, and fed with hay or straw; though, if no shelter be conveniently at hand, they must be driven to the driest spot, and there supplied with *sweet* cut grass and *dry* fodder.

The *hard* or *light stocking of pasture ground* is a point on which many experienced graziers are by no means agreed. By some it is contended, that pastures ought to be stocked very lightly; alleging, that although much of the produce is thus allowed to run to seed, which the cattle will not eat, and which is consequently trodden under foot, where it is rotted by rain, and thus wasted; yet experience, say the advocates for *light stocking*, evinces that a greater profit will, upon the whole, be thence derived than by any other practice, on account of the superior thriving of the animals.

By others, on the contrary, it is maintained, that the practice of light stocking is highly to be condemned; because it not only tends gradually to diminish its produce, but also to encourage the growth of coarse and unprofitable grasses, which materially deteriorate the pastures; and that the *hard stocking* of grass lands, particularly those of a rich quality, is an indispensable requisite of good management. It must be confessed, that the superior fertility of the hard-stocked Lincolnshire pastures tends greatly to corroborate these assertions, which receive further support from the practice of the most experienced graziers in Romney Marsh. It is recommended by a third party, (whose opinion, perhaps, approximates more nearly to the truth,) that mixed stock should be always kept on the same field; for the foul grass, produced by the dung of some animals, will be consumed by others; and as it is well known that different species of cattle prefer different kinds of grass, there is an evident advantage in this practice.

In every field, numerous plants spontaneously spring up,

some of which are disliked by one class of animals, while they are eaten by others; and some of which plants, though eaten with avidity at a particular period of their growth, are entirely rejected by the same beasts at another period of their age. Hence it becomes necessary, not only to have a great variety of cattle in the same pasture, but also a very particular attention is required to augment or diminish the proportions of some of these classes of animals at certain periods of the year; otherwise some part of the produce will run to waste, unless indeed it be hard stocked to such a degree as to retard their thriving.

Where, however, a great variety of animals are allowed to go at large in the same pasture, they rarely feed with that tranquillity which is necessary to ensure thriving. It frequently happens, that one class or sort of beasts wishes to feed or to play, while others are inclined to rest; thus they mutually tease and disturb each other; and this inconvenience is materially augmented, if any sort of *penning*, or confinement, be attempted. Hence it is obvious, that the practice of intermixing various kinds of live stock is productive of evils, which are, in many instances, greater than those resulting from the waste of food intended to be prevented by this practice. There is, indeed, no doubt but that by *hard stocking*, the grass will be kept short, and will consequently be more palateable in general to the animals that eat it, than if it were allowed to grow to a great length; and that even unpleasant patches may thus be consumed; but as animals, which are to be fattened, must not only have *sweet* food, but also an *abundant bite* at all times, in order to bring them forward in a kindly manner, it appears scarcely possible to unite both these advantages with an indiscriminate mixture of stock; it may, therefore, be generally prudent to confine the practice to neat cattle and sheep.

Independently of remedying the inconveniences above specified, a variety of circumstances concur to prove, that the practice of *soiling*, or feeding cattle during the summer with different green and succulent vegetables, which are cut and carried to them; and of *stall-feeding* them in the winter season with dry fodder, in conjunction with various nutritive roots, will in general be highly economical. The former of these modes, in particular, has been but little used till within a few years, and has not been treated with that attention which its importance deserves: hence, we trust, it will neither be inconsistent with

the nature of the present work, nor altogether uninteresting to those who are sedulously aiming at the improvement of their lands, if we consider the subjects of soiling and stall-feeding in the following points of view.

CHAPTER IX.

ON SOILING NEAT CATTLE.

THE advocates of this system support it by the following arguments, which certainly merit the closest attention of the grazier. That:—

I. By introducing the practice of soiling, *a very considerable saving of land* will be effected; one acre of cut grass soiled being equal to three acres used as pasture; and one acre of cut clover being equal to two acres pastured, even of the same field, and sown with the same grass, the clover not being trampled upon, and growing so much faster than if it were often corroded with the teeth of an animal. And it has been affirmed that *sixteen* acres of cut clover and tares will feed as many horses and cattle as *thirty-six* acres of the same kind of grass would do, if used in pasturage *.

II. There is also a very *considerable saving in the quantity of food consumed*, as well as a greater variety of plants eaten, and consequently prevented from running to waste: for when animals are suffered to go upon the field, many plants are necessarily trodden under foot and bruised, or partly buried in the earth; in which state they are greatly disrelished by cattle, and are suffered to run to waste; a circumstance which never could occur, if the practice of cutting were adopted.

And if the consumption of plants be the object principally

* Sinclair, Vol. II. p. 19. An experiment is recorded in "the American Farmer," (Vol. II.) from which it appears, that seventeen acres of land, under the soiling system, supported as much stock as had previously required fifty; and Sir John Sinclair mentions a singular coincidence in another trial, in which thirty-three head of cattle were soiled, from the 20th of May to the 1st of October, 1815, on seventeen acres and a half, of which fifty were necessary in pasture. Code of Agriculture, p. 487.

regarded, it is obvious that the benefits thence to be derived will be very great; for experience has clearly proved, that cattle will eat with avidity many plants, *if cut and given to them in the house*, which they never would touch while growing in the field: such are the dock, cow-parsley, thistles, nettles, and numerous other plants; yet, on the other hand, it is known that they will eat food, *when thrown to them on the ground*, which they will reject when given in the stall. We confess, we know not to what circumstance this can be attributed; but the fact is, that the animals will eat them without exhibiting any marks of dislike or reluctance, even when they are not pressed by hunger; and they often greedily devour these plants as soon as they are brought in from the field, and before they can have possibly had time to become hungry. There are even vegetables which, in a green state, are poisons to cattle; but which, when cut and dried into hay or fodder, may not only be given with impunity, but are also eaten with avidity. Such, for instance, is the *water crow-foot* *, with which (according to the statement of Dr. Pulteney†,) the cottagers in the vicinity of Ringwood, on the banks of the Avon, almost entirely support their cattle; and so eagerly do these animals consume it, that they deem it unsafe to allow them more than a certain quantity. Cows, indeed, are asserted to be so peculiarly fond of that vegetable, (which keeps them in good milking condition,) that, exclusive of the scanty pittance they obtained on an adjacent heath, *five cows and one horse did not consume more than half a ton of hay in the course of a year*. Thus, it is evident that fewer plants will either be rejected or suffered to waste.

Farther, it is well known that many of our best and finest grasses, which, when young, form a most palatable food to cattle, are, if once suffered to get into ear, so much disliked by them, that the beasts will never taste them unless compelled by extreme hunger. And as, in most pastures, many of these grasses get into ear from various causes, their produce is, of course, inevitably lost to the grazier; whereas, if cut down by the scythe in proper time, not one plant will be suffered to get into that nauseating state, and consequently no waste can be sustained from this cause.

* The *Ranunculus aquatilis* of Linnæus.

† Transactions of the Linnæan Society, Vol. V.

In addition to the preceding observations, it may be remarked, that those few plants which are totally disregarded by one class of animals, so as to be rejected by them, even in the house, will not, on that account, become less acceptable to others, but greatly the reverse. Thus grass, or other food, that has been *blown* or *breathed upon* by any animal for a considerable time, becomes unpleasant to other beasts of the same species, but not so to stock of another class or variety; for them, indeed, it appears to acquire a higher relish. Even greater defilement by one animal seems to render food more acceptable to others; for straw, which in a clean state has been refused by cattle, if employed as a litter for horses, acquires for the former such a relish, that they seek for it with avidity. Hence it happens, that the sweepings of the stalls from one animal supply a pleasing repast for those of another kind, which can be easily removed from one to the other, if the plants are consumed in the house, but which must otherwise have been lost in the field. And this peculiarity may, as we shall shortly have occasion to show, be employed to answer another useful purpose.

III. With regard to the influence produced by soiling on the *health and comfort of cattle*, the balance is conceived to be clearly in favour of the cutting system, when compared with that of pasturing. Thus, they are not liable to be blown or hoven, or to be staked or otherwise injured by breaking fences: and it is well known that when animals are exposed to the sun, in the open air, they are not only greatly incommoded on many occasions by the heat, but are also annoyed by swarms of flies, gnats, and hornets, which, as well as the terrible *gad-fly* *, drives them into a state of perturbation little short of madness, which must obviously tend to impede their thriving. At other times they are hurt by chilling blasts, or drenched by cheerless rains, which retard their feeding. Under proper management, in well-constructed stalls, all these evils would be alike removed, and they would be kept in a uniform state of coolness, tranquillity, and ease, so as to make the same quantity of food go farther in nourishing them than it otherwise could have done; beside which, numerous lingering diseases may thus be often prevented, that always impede the thriving of the cattle, and not unfrequently terminate the existence of the beast. Lastly,

* The *Œstrus bovis* of Linnæus, sometimes called the *breese*.

by judiciously mingling green and succulent vegetables with dry and nourishing food, as circumstances may require it, in any given proportions; and by varying the different articles so as to provoke an appetite, not only the health, but also the thriving of the creatures will be greatly augmented beyond what they could have been by any other mode of treatment.

IV. The proportional increase of manure obtained by soiling and stall-feeding, further evinces their superiority over pasturing. *Manure* is the life and soul of husbandry; and, if it is chiefly to be attended to, there can be no comparison between the two modes of consumption, especially with regard to the manure obtained by soiling live stock, during summer, with green food; for, in consequence of the increased discharges of urine during that season, the litter, of whatever substance it may consist, is speedily converted into dung. And there can be no doubt, but that the quantity of manure made during the summer may, by constructing proper reservoirs for the reception of the stale, and by throwing this at leisure times over the litter, be made to equal, if not exceed, the *produce* of the dung accumulated during the winter. The *quality* must depend on the nature of the food.

V. With regard to the *quantity of herbage* afforded from the same field, under the *cutting* or *grazing* systems, the balance will be found equally in favour of the former. All animals, it is well known, delight more to feed on the young and fresh shoots of grass than on such as are older. Hence it invariably happens, that those patches in pastures which happen to have been once eaten bare, in the beginning of the season, are kept very short throughout the remainder of that season, by the animals preferring them to other parts of the field where the grass is longer; so that the latter are often suffered to continue in a great measure untouched throughout the year. Another circumstance, however, which is not very generally known, is, that grass—even the leafy parts of it—when it has attained a certain length, becomes stationary; and, notwithstanding it will retain its verdure in that state for some months, yet it would have continued in a constant state of progress, advancing with a rapidity, in a great measure, proportioned to the frequency of its being cropped *. But the diminution of produce that must

* See Dr. Anderson's valuable Essays on Agriculture, &c. Vol. II. Dis-

be incurred, has not, to the best of our information, been adverted to by those who are most interested in it; nor do these important facts in rural economy appear to have entered into their consideration. Experiments have, indeed, been brought forward to prove that with clover, rye-grass, lucern, and tares, a *treble number* of cattle may be supported in much better condition than by pasturing; and from the results of other trials, it appears to be equal to five, or even a larger number. Many exaggerated statements have, indeed, been produced in support of the system of soiling; but, without attaching implicit faith to these, we are convinced, from actual observation, that, by judicious management in this respect, the profits of the grazier may be largely augmented.

The practice of soiling and stall-feeding cattle has also been adopted, to a considerable extent, on the continent, by Baron von Bulow and others; the result of whose experience is inserted in the first volume of the "Communications to the Board of Agriculture", by Dr. Thaer, physician to the electoral court of Hanover, and which, he observed, has proved the following facts to be incontrovertible.

1. "A spot of ground which, when pastured upon, will yield sufficient food for only *one* head, will abundantly maintain *four* head of cattle in the stable, if the vegetables be mowed in proper time, and given to the cattle in a proper order.

2. "The stall-feeding yields at least double the quantity of manure from the same number of cattle; for the best and most efficacious summer manure is produced in the stable, and carried to the fields at the most proper period of its fermentation; whereas, when spread on the meadow, and exhausted by the air and sun, its power is entirely wasted.

3. "The cattle used to stall-feeding will yield a much greater quantity of milk, and increase faster in weight, when fattening, than when they go into the field.

4. "They are less subject to accidents, do not suffer by the heat, by flies and insects, are not affected by the baneful fogs, that are frequent in Germany, and bring on inflammations; on the contrary, if every thing be properly managed, they remain in a constant state of health and vigour."

quisition V. where this interesting fact is corroborated by experimental proofs, which our limits forbid us to introduce.

The facts and inferences above stated fully prove the advantages of soiling. It ought not, however, to be concealed, that there are some inconveniences attendant on the soiling and stall-feeding of cattle; though, when compared with the disadvantages resulting from other methods, they are trivial. Such, for instance, is the additional labour and expense incurred by carting the green vegetables home to sheds, both in winter and summer. But these are compensated, in a tenfold degree, by the increased value of the food, the thriving of the cattle, the making of the dung under cover, and having reservoirs in which to catch the urine. With this management, one good acre of turnips will produce an excellent dressing for an acre and a half of land, and will completely winter-fat an ox of fifty score. If fed on the land, two acres may fat an ox, but not so well; and the dressing will be very partial and precarious. Further, where large quantities of food are accumulated together for a considerable time, it is objected, that they are liable to fermentation, and of course to waste; such are cabbages, turnips, and other roots; so, where tares are left on the ground they are liable to become podded, in consequence of the butt-ends of the vegetables being of a coarse nature, and in a decaying condition, in which state they are uniformly refused by beasts. But these, and many other disadvantages that might be mentioned, may be obviated by paying due regard to the storing of the various vegetable crops, and to their economical consumption. It has likewise been objected, even by persons who in general approve of soiling and stall-feeding, that cattle will, by confinement during the summer months, be too much heated, and that their health will be affected; but stalls may be so constructed as to admit a regular circulation of air, and yet shelter them from the attacks of flies. The cattle may also be allowed the freedom of an open yard. Indeed, in that season, *fold-yards*, with open sheds, are much to be preferred to stalls. This is the practice in Yorkshire, where the management of stock is well understood; and there are not wanting many experienced grasiers who prefer air during the utmost inclemency of winter. Air is, indeed, indispensably necessary to the preservation of the health and the speedy fattening of animals; for, if kept too hot, they will perspire profusely, and their hides will itch; this vexes them exceedingly, and necessarily retards their quick feeding.

When grass (whether natural or artificial) is to be given, it

ought to be cut in the morning for the evening food, and in the afternoon for the morning mess; the afternoon crop should be carried to the barn, or some other convenient place, and spread out in order to exhale its superfluous moisture; and, in rainy weather, both crops must be taken off the ground. Attention, however, ought to be paid to the due proportion to be cut; and, until that fact be ascertained, it is a good plan to measure each mess, and to chalk down the quantity *in weight*, which the basket, cart-body, or other vehicle employed for carrying food, contains of the various articles used for that purpose. The practice will, at least, have a tendency to teach farm-servants to observe *method*, the value of which is of considerable importance in all business, particularly in the various branches that are connected with, or dependent on, a grass farm. On the supposition, therefore, that seventy-five pounds weight of green clover will be sufficient for one beast, he observes, that where thirty-two head of cattle are to be fed, 1,200 pounds will be cut twice in the day; thus eight acres, cut four times in the season of soiling, will, on an average, give one cutting in six weeks, or nearly thirty perches are cut daily. A man and a boy may perform all the work, and pay all the attention requisite in soiling that number.

As the various grasses peculiarly calculated for grazing or soiling cattle, will be particularly detailed in a subsequent Book *, we proceed now to state a few of those articles which have been found most useful for the purpose of winter or stall-feeding, or of feeding in the farm-yard.

CHAPTER X.

OF STALL-FEEDING NEAT CATTLE.

This branch of the grazier's management begins about the end of October, and lasts for about seven months, that is, till the commencement of May. Of all vegetable productions, *good hay* is undoubtedly the best for fattening cattle, when judiciously

* Book XI.

combined with cabbages, carrots, parsnips, turnips, or similar succulent plants; though such hay, except on the most luxuriant soils, will rarely be found capable of fattening animals without the aid of other food, when finishing off for the market. Barley, rye, oat or pea meal, if mixed together, in about equal proportions, with the occasional addition of a small quantity of bean meal, may likewise be given with advantage, in the ratio of a quartern, or at most half a bushel, to each head of cattle, in conjunction with cut *hay*, if the price will admit. Of the last-mentioned article it may be observed, that the hay made from grass mowed after the cattle, is usually employed for feeding live stock at the beginning of winter, the best being reserved for the spring, before the cattle are turned out to grass; and where a handful of salt has been thrown over each load, as packed in the loft, so grateful is this condiment to them, that they have been known to prefer poor hay *salted* to good hay *unsalted*. Salt acts as a condiment, which appears to assist the digestion; and, from the avidity with which ruminating animals eat it, nature seems to have intended it for their benefit.

The most luxuriant of all vegetable productions, perhaps, is the *cabbage* with its numerous varieties, which, when combined with cut pea or oat straw, has been found singularly useful as winter fodder for *store stock*; and which, with the addition of good hay, will fatten oxen or bullocks in the short space of five months, beside yielding a larger quantity of manure than almost any other article used for winter feed.

Parsnips have been employed not only for feeding store cattle, but particularly for fatting oxen, which eat them most advantageously; the benefit thence derived being, in the estimation of some graziers, nearly equal to that obtained from oil-cake: but they are apt to cloy the appetite, and should therefore be given with other food, or if alone, they should not be continued for a long time together.

Next to parsnips we may class the *Carrot*; a most useful root, the produce of which is so abundant that, according to the account of Mr. Young, *four* bullocks, *six* milch kine, and *twenty* work-horses were fed, a few years since, at Partington, in Yorkshire, for above *five* months, with carrots, the produce of three acres, with no other addition than *a little hay* throughout that period. He adds, that the milk was excellent in point

of quality and flavour; and the refuse or waste, with a small quantity of other food, fattened *thirty* swine *.

Turnips, especially when steamed, also supply a nutritive article of winter food; though, from their peculiarly moist nature, they will probably require to be combined with cut hay, to which a little barley or oatmeal may occasionally be added.

In the county of Norfolk, however, which has long been celebrated for its turnip husbandry, there are very great numbers of cattle annually fattened for the London market, on little other food than turnips, which are given to them *whole*, and in a raw state; and it rarely happens that any animal is choked, or otherwise injured, by roots sticking in the throat. Should this accident, indeed, occur, the practice is to pour a horn full of salt and water down the beast's throat; and in case that does not succeed, Mr. Bayfield, an eminent grazier and farmer of that county, pours down a similar quantity of *salt and melted grease*, such as hog's lard, or any common grease; which preparation (except when it was applied in one instance too late) he has never found to fail of procuring relief to the animal in danger of suffocation.

Mr. Marshall, to whom we are indebted for the preceding, as well as for the subsequent particulars, conjectures, that warm oil and salt would perhaps have the same effect. Having stated this remedy, which we conceive to be justly deserving the grazier's notice, on account of its cheapness and facility, we now proceed to detail a few of the more striking points of the Norfolk mode of *turnip-fattening* cattle, which, although not coming strictly within the meaning of stall-feeding, yet being a part of the system of winter-feeding, we trust will prove highly interesting.

* This is one proof, among many, of the vague manner in which experiments are often stated, and consequently of the little reliance to be placed on them, when all the details are not accurately stated. Without at all meaning to depreciate the value of carrots, the excellence of which, as food for cattle, is now universally admitted, it cannot escape observation, that they must, in this instance, have been accompanied by *no small quantity* of hay; for only allowing one bushel of carrots per day, to each beast, the quantity would amount to 4500 bushels, exclusive of the swine; that is, 1500 bushels per acre, or about three times the amount of a good crop.—Ed.

The method in question is three-fold *:—According to the first plan, the roots are thrown on stubbles, grass lands, and fallows, to cattle abroad in the fields. This is the prevailing practice, the greater part of the cattle fattened in that district being fatted abroad: it requires the least attendance, and is allowed to be beneficial to light lands.

The general practice in the county of Norfolk is, to begin with the wheat stubbles, on which turnips are usually thrown, till they are broken up for fallow or barley. The next *throwing-ground* is frequently the barley stubbles, which receive the bullocks, (i. e. fatting and fatted cattle,) as the wheat stubbles are scaled in, and retain them until they are, in their turn, broken up for a turnip fallow. From Christmas till early in April, the clover lays only are thrown upon: and after these are shut up, in order to acquire a bite of rye-grass for the unfinished bullocks, the turnip fallows sometimes become the scene of throwing.

Occasionally, however, the farmers deviate from this mode; some objecting to the throwing of turnips on land intended for those roots the following year, under the apprehension that it produces the disease termed *anbury* †. In this case the clover lays succeed the wheat stubbles, some part of them being kept open till the turnip crop is finished in the spring. Sometimes young clover fields are thrown open; but this is regarded as bad management, unless the season is remarkably dry, and the surface of the earth is perfectly sound; nor is it often done unless there happens to be no clover stubble in the vicinity of the turnip piece.

But though the soil of Norfolk is, in general, remarkably dry, the farmers of that district are sometimes inconvenienced, in wet seasons, for clean ground on which to throw their turnips; and notwithstanding the value of *teathe* ‡, when the land

* Marshall's Rural Economy of Norfolk, vol. i. p. 267.

† The nature and probable cause of this affection in turnips will be stated in Book XI. Chapter V., where the culture of these roots is discussed.

‡ "This is an important word in Norfolk husbandry, for which our language has no appropriate synonym: it denotes the fertilizing effect of cattle upon the land on which they are foddered with any kind of food; whether such fertilizing effects be produced by their dung, their urine, their treading,

will bear the bullocks, instances have occurred where farmers have requested their neighbours to allow them to throw turnips upon a contiguous piece of old ley-ground, or *olland*, as it is there called; preferring the loss of his teathe to checking his bullocks. On this account, therefore, Mr. Marshall recommends, in laying out a farm upon the Norfolk plan, so to intermix the crops, that there shall be at least two pieces of ley in the neighbourhood of each piece of turnips.

The turnips are thrown on the land in the following manner: a cart enters on one side of a close, in which stands a boy, who, as the vehicle is going regularly to the other, throws the roots out, with their tops and tails on, as they are drawn out of the ground; giving every part an equal share, and never throwing twice in the same place, until the whole has been gone over. In the commencement of the throwing season, while there is yet an abundance of grass for lean stock, the usual practice is, to keep the fatting beasts constantly in the same piece of wheat stubble, a fresh supply of roots being given to them every day, or every second day at farthest.

When the clover stubbles are cleared from grass, and the store cattle begin to require assistance from the turnips, the fatting cattle have *followers*, i. e. rearing cattle: lean bullocks, cows, or store sheep follow them to pick up their refuse. In this case it becomes convenient to have three *shifts*, or three pieces of throwing-ground in use at the same time: one allotted for the head beasts, another for the followers, and a third plot empty, for the purpose of throwing turnips on it. Two pieces, or at least two divisions of the same piece, are indispensably necessary; and sometimes a row of hurdles is run across a throwing-piece, in order to separate the *bullocks* from the *followers*.

In throwing turnips, it is of great importance that they be thrown *evenly* and *thinly*, so that while a beast is breaking up one root, he cannot have it in his power to trample or dung upon another. But sufficient precaution is seldom taken to guard effectually against this inconvenience—though if turnips are cast at the distance of one yard asunder, they are not ill thrown—as they are too often dropped in rows, or clusters, of half dozens together.

by their breath, perspiration, and the warmth of their bodies."—Marshall's Norfolk, vol. i. p. 34.

Bullocks, which are on turnips abroad, are sometimes driven into the straw-yard at night, where the distance is not too great; and, occasionally, a little straw is given them under the hedge of the throwing-piece, when they continue entirely abroad. The quantity of straw thus consumed is very trifling; the object of it being merely to cleanse their mouths from the dirt of the turnips, on which alone the farmers place all their dependence for bringing their cattle forward.

Mr. M. remarks it as an interesting fact, that not one in ten of the highly-finished *bullocks*, which are annually sent to Smithfield out of Norfolk, taste a handful of hay, or have scarcely any other food whatever than turnips and barley straw, excepting such as are fattened off in the spring with ray-grass; and a few that are fatted by superior graziers, who make it a point to give a little hay to their bullocks at turnips, towards the spring, when those roots are going off, and before the grass-leys are ready for their reception; an excellent practice, which ought, if possible, to be generally adopted, as without such precaution bullocks are liable to be checked in their progress between turnips and grass. The cattle usually fatted in Norfolk are Scots; instances however have occurred, though rarely, in the county of Essex, in which Northumberland beasts, of the largest size, have been fattened on *turnips alone*, without the aid of any other food.

The *second method* of giving these roots to cattle is by means of close bins, or small cribs, with boards or bars nearly close at the bottom, while the beasts are kept in a loose straw-yard. These bins are dispersed over the yard, and the turnips are put into them *whole;* the tap-root, and also the tops, unless they are fresh and palateable, being previously cut off, so that the fatting animals receive only the bulb; the tops, if eatable, being consumed by store cattle.

While the bullocks are in the yard, they have the straw sometimes given them in cribs, and at others it is scattered in small heaps about the yard, twice or thrice in the day; the quantity thus eaten is very trifling, and with the last-mentioned management, the yard becomes evenly littered without further trouble.

The mode of fattening here detailed is attended with somewhat more labour than the preceding method of throwing turnips abroad, which, in Mr. Marshall's opinion, is the preferable

management, if the soil be sufficiently dry to support stock, and light enough to stand in need of being rendered firm by treading; on the contrary, where the land is deep, and the season is wet or severe, the straw-yard is the more comfortable place, provided it be kept dry and well littered, and be furnished with open sheds, in which the stock can shelter themselves. For, though the *teathe* of fatting cattle abroad is greatly beneficial to light soils, yet if bullocks, while fed in the yard with turnips, are well littered, they will make a large quantity of excellent manure, that will amply compensate for the additional labour thereby occasioned.

The *third method*, above referred to, consists in keeping the cattle tied up in hovels, or beneath open sheds, with mangers or troughs for receiving the turnips, which, in this case, are frequently *sliced*, or more generally (though perhaps less eligibly) cut into quarters by means of a small chopper, upon a narrow board or stool, beneath which is a basket for catching the pieces. In this operation the turnip is held by the top, which, when wholly disengaged from the root (except the coarse part immediately about the crown) is thrown aside for the store cattle. The tap-root and bottom rind are separated with the first stroke, and suffered to fall on one side of the basket, so that the fattening animals have only the prime part of the plant.

Hence arises the quick progress in fatting, which bullocks fed under sheds sometimes make, especially in cold weather; but, from the increased trouble and expense consequent on this practice, though it requires less litter, it is confined chiefly to little farmers, who have opportunity to tend their own sheds. Under this treatment, the beasts have a little barley straw given them occasionally, in order to clean their mouths, and dry up the superfluous pieces of the turnip.

From the preceding facts and statements, Mr. Marshall conceives an eligible plan of management may be adopted, where circumstances will admit of it. In autumn, therefore, while the weather continues moderate, the bullocks may be allowed to remain abroad; but whenever it sets in very wet, or becomes intensely severe, they should be taken and kept under shelter, either until their fattening be completed, or the warmth of spring again invites them abroad. The whole plan is at variance with that of regular stall-feeding, which is founded on the

principles of accumulating dung in the heap, and of keeping the cattle in an equal state of warmth; which latter point is generally considered essential to their improvement in flesh. It will, however, be observed, that the Norfolk system combines the improvement of the land with that of the beast; an object which is much promoted by the treading of the animals on the light soils of which that county is chiefly composed. It must also be admitted that many experienced graziers are adverse to stall-feeding, as being prejudicial to health.

Many instances could, however, be adduced in which stall-feeding has been successfully carried to the opposite extreme of heat and confinement. Among others, two are mentioned by the late Arthur Young: the one, in the practice of a very fortunate grazier, Mr. Moody, of Retford, who found warmth of such consequence, that he gradually closed the air-holes of the building, provided with sliders on purpose, till his beasts sweated off the hair, and they did not thrive to his mind until this happened: the other, in a similar system pursued on the farm of Mr. Hanbury, of Coggeshall, who considers it essential to keep the beasts as warm as possible; and that even if it brings off the hair, they thrive the better, and will feel the better at Smithfield.

Mr. Young, whose opinions on agricultural subjects, though sometimes too speculative, are, from his great experience, entitled to the highest respect, was decidedly in favour of warmth; and both on that subject, and on the general slowness of farmers to adopt improvements, he thus strongly expressed himself: "Men farm without an idea of any necessity of knowing what others have done before them; nay, they encourage themselves in ignorance, by a pride of rejecting book-husbandry; and it is very right that thousands of pounds should have been lost by oil-cake feeding shivering beasts in open sheds, by men who think they can learn nothing beyond the practice of the old women their grandmothers; while the Board of Agriculture is annually bringing to light, in County Reports, practices unknown to the very men who cannot see any use in such publications: but ignorance is its own punishment."*

To return from this digressive account of the Norfolk turnip-management, the importance of which, we trust, will be a suffi-

* Survey of Essex, 1813. Vol. II. p. 304.

cient apology for its length — *Mangel-wurzel* comes next in order, in feeding cattle; and, in some experiments made in the county of Hertford, they have been found superior to carrots, and nearly equal to parsnips.

This may, indeed, be an exaggeration of its value; but as an analysis of the nutritive qualities of the different roots and grasses will be found in Book XI. Chap. VI., it is unnecessary to discuss their comparative merits here.

Lastly, among the various vegetable productions that have been appropriated to the stall-feeding of cattle, none have occasioned greater discussion than *Potatoes*. They furnish an excellent supply, particularly when cut and steamed*; and from the subsequent facts, they appear adequate to the fattening of neat cattle, in combination with a comparatively small portion of other food. In the eleventh volume of "Annals of Agriculture," we meet with the following statements relative to these roots, by J. H. Campbell, Esq. of Charlton, in Kent, an able and successful grazier, in answer to some queries that had been proposed to him by Mr. Young. He observes, that 100 bushels of potatoes, and 700 weight of hay are generally sufficient to fatten any ox that thrives tolerably well. The roots should, at first, be given in small quantities, which should then be gradually increased to one or two bushels per day; dry food being always intermixed, and the proportion of hay being uniformly regulated by the effect which the potatoes produce on the bowels. There ought to be at least *five servings* in the day; and according to the quantity of roots which a beast can be induced to eat with appetite, he will fatten the sooner, of course with less expense and more profit. The hay should be cut once, or if it be not very weighty, twice along, and three times across the truss, so as to be in square pieces of eight or ten inches, in which state the cattle will eat and digest it more readily, while their fattening is considerably expedited. The potatoes, however, according to Mr. C., need not be cut, except at first, in order to entice the beasts to eat them; but they ought always to be *fresh* and *clean*. No corn or meal is necessary, unless it can be procured at a moderate price; in which case it would contribute materially to facilitate, and of course to render more profitable, the whole system of cattle-feeding.

* For a simple steaming apparatus, see Book VII. Chap. II.

Should a *scouring* be brought on by the use of raw potatoes, which often happens, the quantity of meal or other dry food given with them should be increased, until the beasts become accustomed to the roots, when this inconvenience will cease.

Potatoes, however, being an article of constant consumption in our markets, are more subject to variations of price than any of the other roots commonly used for fattening cattle. The grazier must, therefore, be governed by the consideration of their comparative cost, as well as quality. The cultivation of potatoes is also expensive; and therefore even in remote situations, which do not afford a constant market, their cost is considerable. There is also a general impression (whether well founded or not, it is not our present purpose to inquire) that they exhaust the land; in consequence of which, they are seldom resorted to as a *fallow crop*, which alone, it may be observed, ought, in addition to grass and hay, to form the basis of all profitable feeding. It should also be remarked, that when given raw, during a long time, they have been frequently found prejudicial to the health of cattle: the cause has not been ascertained, but it may, possibly, be owing to the poisonous quality known to exist in the juice of the root. When given steamed, it has been found an improvement to combine them with *Swedish turnips:* the turnips being *boiled*, and the juice given with the dry potatoe.

In some districts where winter food is with difficulty procurable, it appears that *heath* may be advantageously resorted to. In an interesting paper on this subject, communicated to the Board of Agriculture by James Hall, Esq., he states, that in the course of numerous experiments on furze, broom, rushes, bean-straw, and other neglected articles, he had discovered, that, if heath be cut when young and in bloom, and the finer parts be infused in hot water, it produces a liquid very grateful to the taste, well flavoured, and extremely wholesome. Being anxious to know how far young heath might be useful to cattle, he tried the experiment on a cow. When first tied up, she refused to eat any of the heath, except the very finest part, nor did she appear to relish an infusion of it when set before her: hunger, however, compelled her first to drink the infusion, and then to eat the heath; and on this food only she lived for nearly a fortnight, during which her milk was reduced in quantity, though its quality was much improved. A similar experiment

was made on a couple of sheep and an old horse, with nearly the same effect. Satisfied from these experiments that cattle may be supported for a long time by young heath, Mr. Hall proceeded to ascertain how far the plant was capable of retaining its valuable qualities when dried and laid up. He therefore cut some at the end of the summer, and dried it in the shade; and, at the end of two years it produced an infusion equally strong and well flavoured as at first; and the effect was the same at the end of three years. Mr. H. further states, that if heath be cut when in bloom, and boiling water be poured on it in a tub, an infusion will be produced, not only rich and pleasant, but capable of being made the basis of various valuable liquors; and that any quantity of young heath may be procured by burning the old which remains on the ground. The ashes afford an excellent manure, and generally cause a fine young crop to spring up: this may also be cut for hay at two or three years old, and may be given to cattle when fodder is scarce; but, when intended for this purpose, it should be carefully stacked and kept close, otherwise it will become less valuable*.

Fir-tops, or the young and tender *shoots* of fir trees, have likewise been employed with effect in a case of emergency, as a substitute for other articles of winter fodder. Of this circumstance we have a striking illustration in the fifth volume of the "Letters and Papers of the Bath and West of England Society," where a correspondent states, that, being in great want of provender, and having scarcely any hay, he was compelled to feed his beasts on fir tops. And though he had more than four hundred head of neat cattle, yet he did not lose above *four* or *five* out of that number; while many graziers, farmers, and breeders, who resided in the same county, lost one-half, and several of them nearly the whole of their live stock. We state this fact, as it was communicated to the respectable society above mentioned; and would recommend attentive experiments to be farther made with this vegetable production, as, in the event of a scarcity of winter provender, it promises to be a salubrious and invigorating food, which might in a short time be collected †.

* Communications to the Board of Agriculture, Vol. VI. Part II.

† They have also been used by Mr. Coke, at Holkham, with considerable advantage.

CHAPTER XI.

OF ARTIFICIAL FOOD FOR NEAT CATTLE.

HAVING thus stated the various vegetable productions which have been beneficially employed in feeding and fattening neat cattle, we proceed to detail a few hints respecting other articles which are, or may be, likewise employed with advantage. For this purpose, *linseed-oil cakes* have long been celebrated as eminently useful: they are asserted to have a very extraordinary effect on cows before calving, causing their milk to spring more copiously, and preparing the animals for the critical period of calving. But, as the price of the cake has of late years greatly increased, it has been recommended to substitute *linseed jelly*, which is infinitely superior; and which, when mixed with a due proportion of hay or meal, affords an excellent composition for stall-feeding and fattening. It is prepared in the following manner: To seven parts of water let one part of linseed be put, for forty-eight hours; then boil it slowly for two hours, gently stirring the whole lest it should burn. Afterwards it ought to be cooled in tubs, and mixed with meal, bran, or cut chaff, in the proportion of one bushel of hay to the jelly produced by one quart of linseed, well mashed together. This quantity given daily, with other food, will forward cattle rapidly; but it must be increased when they are intended to be completely fattened.

In America, experiments have been tried with *linseed oil* mixed with the meal of Indian corn. The stall-fed steer, to which the composition was given, was observed to *thrive rapidly, and to sweat most profusely*; but, through inattention, too large a proportion of oil was given at one time with the food, which disgusted the beast, and occasioned the experiment to be discontinued. It has also been tried in this country, in the proportion of one quart to three bushels of hay cut into chaff and left to heat; and the fattening quality of the hay has been thus much improved. It has also been mixed with wheat bran; but the experiment did not answer, and unless given in extremely moderate quantities, it probably would be found to be too stimulating in its effects. There can, however, be no doubt, but that linseed or flax-seed jelly is more agreeable to cattle than

cake, while it renders them less liable to surfeit in case an extra quantity should be accidentally given, and is less liable to affect the meat with a peculiar taste than either oil or cake, and consequently it merits a trial; but it will be requisite to change this food about a month before the beast is killed, to prevent, if possible, the flesh from retaining the flavour of the oil cake, or jelly.

Cattle, fed on sour food, prepared by *fermenting rye-flour and water* into a kind of paste, and then diluted with water, and thickened with hay cut small, are also said to fatten quickly. This practice chiefly prevails in France, whence it was introduced into this country. Concerning the efficacy of acid food in fattening animals, there is much difference of opinion. It is well known, that hogs derive more benefit from sour milk and swill than when those articles are in a fresh state; and it is highly probable, that sour articles may contribute to promote digestion, and by facilitating the consumption of a large quantity of food in a stated period, consequently expedite the fattening of cattle. *Brewer's grains* are sometimes used in that state; but *distiller's grains* differ from them in having a proportion of rye frequently mixed with the malt, which renders them more naturally sour. But such acid messes can only, we conceive, be considered as preparatory to the more forcing and essential articles of dry food: without which it is scarcely possible that any steer, or bullock, can acquire that firmness of muscle and fat which is so deservedly admired, and considered as the criterion of excellence.

The *wash*, or refuse of malt, remaining after distillation, which was formerly applied exclusively to the feeding of swine, has of late years been applied with success to the stall-feeding of cattle. It is conveyed from the distillery in large carts, closely covered, and well jointed, in order to prevent leaking. The liquor is then discharged into vats, or other vessels, and when these are about two-thirds filled, a quantity of sweet hay, previously cut small, is immersed for two or three days, that the wash may imbibe the taste or flavour of the hay before it is used. In this state it is carried to the stalls, and poured into troughs, whence it is in general eagerly eaten by cattle. Sometimes, however, the beasts are at first averse to this mixture, in which case it has been recommended frequently to sprinkle their hay with the wash; thus, having the smell continually before them, and

seeing other animals eating the same composition with avidity, they gradually become accustomed to it, and at length greatly relish it. The cattle fed in this manner are asserted, not only to repay the expense of their keeping by fattening speedily, but also yield a large quantity of valuable manure.

One of the most successful instances of this mode of fattening cattle, which has occurred within our observation, is that of Messrs. Hodgson and Co. the proprietors of Bolingbroke-house distillery, Battersea, near London*. They have erected stalls for fattening about 350 head of cattle at one time, with wash and grains, and a certain portion of hay *per diem*, with the view of enabling them to chew the cud. The beasts formerly stood or lay upon a framing of lattice-work, or trellis, (which was raised a little above the pavement,) and had neither straw nor haulm, but only the bare boards, for their bedding. But the unevenness of the surface being found exceedingly injurious to their feet, that practice has been relinquished, and the stalls are now paved with bricks.

Between October and April, which is their regular working season in the distillery, they fatten as near as may be 600; having generally about 350 in the house tied up at one time, and about 100 in an adjoining orchard to take in, to replace such as are sold off. They have no stated period for fattening these bullocks, being regulated entirely by the state of the markets; but from ten to sixteen weeks is about the usual time, and the cattle are found to gain, upon an average, the very unusual quantity of from three to four stone per week. Their food is wash, grains, and hay, sometimes meadow, at others clover, and occasionally relieved by oat or barley straw, which is sometimes, though not regularly, cut into chaff: hay or straw is given to them twice a day, in order that they may ruminate, and as much grains and wash as they can eat. In general, they come readily to this kind of food, though some are four or five days before they lose their aversion to it.

The stock fattened at the distillery above named, consists of cattle of every sort and size. There are many Scotch cattle, or kyloes, as well as those reared in Northumberland, Wales, and Herefordshire, but none of the Sussex or Devonshire breeds, which Messrs. H. and Co. say are too dear for them. Ac-

* Malcolm's Compendium, Vol. I. p. 355.

cording to their quality, the cattle are supposed to pay from *five* to *twenty shillings* per week.

Other trials have, however, been made, which have not proved so satisfactory. Messrs. Smith and Harrington, of Brentford, fattened 810 oxen on the refuse of 25,750 quarters of barley: they were in tolerable condition when taken in, and averaged about 110 stone each. In twenty weeks they acquired of flesh at the rate of about 35 stone each; from which, 5 stone is to be deducted, as the value consumed by them in hay; leaving 30 stone as the produce of the distillery: thus 810 beasts produced 24,300 stone of beef, or about one stone for the grains from a quarter of barley.

The same gentlemen have fatted 250 bullocks on the refuse wash of a sugar distillery: they were kept four months, and increased in value 8*l.* each: hay was 4*l.* to 4*l.* 10*s.* per load, and they were allowed 30 to 40 quarters of brewer's grains daily; but the quantity of hay consumed was so great, that money was lost by the experiment, though the wash was only valued at 20*s.* each.

With equal success has *molasses*, or *treacle*, been employed; though the expense incurred by the use of this article will probably prevent its general adoption in this country. It has been used in the West Indies, in combination with farinaceous substances, and, when these could not be procured, with cane-tops, oil-cake, and other articles of dry food, together with a little hay, or not too green fodder, and has been found greatly to expedite the fattening of cattle in general, and of old and decayed oxen in particular; in the proportion of half a pint to a pint of molasses, twice in the day, to animals which had been exhausted by continual and severe labour for a long series of years. In adopting this article, a gallon of oats, or other damaged grain, roughly ground, or the same quantity of potatoes, should be boiled in a sufficient proportion of water to form a thick mash. It must be well stirred while on the fire, to prevent it from burning, or sticking to the sides of the vessel; and, when it becomes cool, the mixture is to be formed into balls of about one pound weight each. These balls are divided into two equal portions, which, being previously immersed in the treacle, are given to the beasts in the morning and evening: they will devour them with eagerness, and will speedily thrive and fatten by the addition of a little hay, or any green fodder

that is not too succulent. Further: one or two spoonfuls of salt may be dissolved in the composition, which will contribute to preserve the health of the animals; and, in case corn cannot be conveniently procured and ground, pulverized oil-cake, diluted in water, and seasoned with a small quantity of salt, with the same proportion of molasses, may be advantageously substituted*. Molasses is also commonly given to cattle in the West Indies, in their water, and is found to have an evident effect on their condition: horses, in particular, are improved much in their coat.

In the preceding facts and statements we have referred chiefly to the feeding and fattening of middle-aged and old cattle; *young stock*, however, require particular attention, lest their growth be impeded—which no summer food can restore—and therefore should be fed on the best and most nutritive food the farm can supply. Hence, yearlings should be fed during the winter with hay, turnips, carrots, potatoes, or other roots: where hay cannot be obtained, good straw must be substituted, the proportion of roots being increased and given with attention. For steers and heifers two years old, the proper food is hay, if it be cheap, or straw, with baits of turnips, cabbages, carrots, &c. In summer their food varies so little from that above specified, as to require no particular details on this head.

With regard to oxen used in draught, it should be observed, that they ought to be well fed, and every attention bestowed, that no food be wasted, while they are to be kept in constant employ, particularly in the commencement of spring and in autumn, when their labour is most wanted. During those seasons, they should be supplied with abundance of cut hay and straw, with an allowance of a bushel or two of steamed potatoes, turnips, cabbages, or carrots, per day, in proportion to the work, and to the quality of the fodder as well as of the roots; giving them, while at plough in autumn, such a proportion of oats and chaff as the size of the animal may require, because the grass at that time begins to diminish in its nutritive properties. In summer, the beasts may be soiled with green food, and in the winter stall-fed, in the manner and with the articles above mentioned. Some farmers, indeed, endeavour to support

* For a series of experiments on sugar, as food for sheep, see Book IV. Chap. VI.

working oxen on straw alone, and the possibility of this is one great argument used in favour of their employment; but it will be generally found to injure them in a greater proportion than the saving in food.

A most important object in the feeding or fattening of cattle is, that such arrangements should be made, and such a supply of food be provided for winter consumption, that the farmer or grazier may be enabled to keep them through that trying season, and sell them when meat fetches the highest prices, viz. from the beginning of February to the close of May. By this procedure, he will not only obtain more for the sale of them than the autumnal markets would produce, but his stock will go off freely, and every market be in his favour. He will further obtain the largest possible command of manure, and consequently be enabled to conduct his business to the most profit. Next to a proper stock of keep for cattle, is *regularity in giving them food.* In stall-feeding, it is too common a practice to give a certain mess, or allowance, every day, without regard to any circumstance; the absurdity of which conduct is too obvious to be here particularly pointed out. It is a fact, that a bullock, or fattening beast, will eat with a keener appetite on a cold day than in warm, damp weather; hence his food ought to be proportioned accordingly. By giving the same quantity every day, the animal may be cloyed; thus his appetite becomes impaired, the food is wasted, and several days will necessarily elapse before he can recover his natural appetite. By such delay he must fall away, and many weeks, perhaps months, will be required to bring him to his former flesh.

The relative proportion of food consumed by fatting beasts necessarily varies, according to the size of the animals, and the nutriment afforded by the respective vegetables. It has, however, been found, that an ox will eat something less than one fifth *per diem*, of his own weight of cabbages. Fattening beasts require about eighteen stone of turnips daily, beside an adequate allowance of dry meat to counteract the superabundant moisture of these roots. An acre of twenty-five tons, therefore, will fatten a beast of sixty stone, or something more. For middle-sized animals a bushel or a bushel and a half, of distillers' or brewers' grains will be sufficient, if combined with an ample portion of cut hay, chaff, or bean straw, given between the intervals of allotting the grains. Bullocks, or oxen, vary-

ing from forty-five to sixty stone, consume about eight or ten stone of carrots or parsnips *per diem*, beside an additional quantity of dry provender; that is, in the proportion of one-sixth part of their own weight; and, as a good acre of carrots will yield 400 bushels, or 22,400 lbs. it would support such an ox 160 days, a period sufficiently long for beasts to be kept that have had the summer's grass. If they are half fat when put to carrots, an acre would probably be sufficient to fatten two such beasts. Of potatoes, small cattle (such as those of Wales and Scotland) eat every day about one bushel per head, in a raw state, with an allowance of one truss of hay divided between four beasts. To an animal of eighty or one hundred stone, about eight to ten pounds of pulverized oil-cake are given each day, with half a stone, or one stone of cut hay, in addition, every day, for seven or eight weeks, which allotment of cake is then usually increased to twelve or fifteen pounds, until the animal is sufficiently fat for sale *.

Animals have been not uncommonly supposed to consume a quantity of food in proportion to their weight: but this is purely theoretical; for, in fact, various experiments have proved that although small cattle may be supported on pastures that will not carry heavy beasts, and also on more indifferent soiling food, yet, when put up to fatten, the difference is of no account in proportion to their weight: though cattle of the same weight and breed will sometimes consume different quantities. In proof of this, it may be observed that the London cow-keepers, who have large numbers of different size, supply an equal quantity to each.

But whatever articles of food may be given, they ought to be apportioned with as much regard to *regularity of time and quantity* as is practicable; and if any small part be at any time left unconsumed, it should be removed before the next feed is given, otherwise the beast will loath it. Hence three periods of the day, as nearly equidistant as possible, should be selected, when such an allowance should be given to each animal as he can eat with a good appetite; which point can be regulated best by attending duly to the state of the weather, or season, and the progress he makes in flesh; for as he fattens, his appe-

* See the quantities consumed by different cattle, Chap. II., and Appendix No. I.

tite will become more delicate, and he will require more frequent feeding, in smaller quantities; thus the beast will improve progressively and uniformly, while a trifling loss of food only can occur by such method. In proportion to the nutritive matter contained in the food, the animal will generally be found to advance *; and in order that this important branch of rural economy may be properly conducted, the young grazier will find it serviceable to weigh each beast once a fortnight, at the least, before he gives the morning allowance, by which he will be enabled to form an accurate estimate of the real progress his cattle make in thriving. If they do not continue to advance, according to the result of former weighings, it will be necessary to change their food; and as bullocks will take less meat every week after their kidneys are covered with fat, it will be even well to weigh them once a week, as a more adequate idea of their thriving may thus be formed: thus, supposing an ox to consume food to the value of 9*d.* per day, or 5*s.* 3*d.* per week, and that the price of beef at market is 4*s.* 6*d.* per stone of eight pounds, the return he makes for his keep may be readily calculated.

Of equal, if not superior, importance with regularity in feeding is *cleanliness*, a regard to which is admitted, by all intelligent breeders, to be one of the most essential requisites to the prosperity of cattle. Hence not only ought they to be supplied with abundance of pure water, but also, whenever they are brought into the stalls, either from pasture or from work, their feet ought to be washed, lest any filth should remain there and soften their hoofs. Further: frequent washing after hard labour, or at least once in the week, should be performed; and, though the practice of currying and combing, or of friction with brushes, cannot perhaps be adopted, or carried into effect, where the herds of beasts are numerous, yet, we conceive, they might be often rubbed with a wisp of straw to considerable advantage. The mangers and stalls should likewise be kept as clean as possible; and the former, if they cannot often be washed, should be cleared every morning from dust and filth, which may be easily effected by means of a common, blunt-pointed bricklayer's trowel: they otherwise acquire a sour and offensive smell from the decay of vegetable matter left in them; which nauseates the cattle, and prevents their feeding. After the stalls have been cleansed by constantly removing the dung

* See Book XI. Chap. VI.

and sweeping the pavement, a sufficient quantity of fresh litter ought to be strewed over, which will invite them to lie down; for nothing contributes more to expedite the fattening of cattle than moderate warmth, ease, and repose. In fact, where *straw* can be obtained at a moderate price, supposing the farm does not yield an adequate supply for this purpose, the stalls and farm-yards ought always to be well littered, especially during the winter season.

The quantity of manure thus made is an essential object; for it has been found that forty-five oxen, littered, while fatting, with *twenty* waggon-loads of stubble, have made *two hundred* loads, each *three* tons, of rotten dung. Every load of hay and litter, given to beasts fatting on oil-cake, yields *seven* loads of dung, of *one ton and a half* each, exclusive of the weight of the cake. And, on comparing the dung obtained by feeding with oil-cake with that of the common farm-yard, it has been found, that the effects produced by spreading *twelve* loads of the former on an acre, considerably exceeded those of *twenty-four* loads of the latter manure. It is, in fact, invariably found that the value of the manure is in proportion to the nutriment contained in the aliment. By another trial it appears, that thirty-six cows and four horses, when tied up, ate *fifty* tons of hay, and had *twenty* acres of straw for litter; they made *two hundred* loads of dung, in rotten order for the land:—a difference in weight which is accounted for by the absorption of moisture by straw.

CHAPTER XII.

OF THE SALE OF NEAT CATTLE.

HAVING now stated the leading facts and experiments that have been made on the subject of feeding and fattening neat cattle, we shall conclude the present section with a few remarks on the *sale* of beasts, when properly fattened for that purpose. In order to ascertain this point, the following hints may, perhaps,

afford some criterion. First, when the general shape and composure of an animal appear best proportioned, each member being comely, and each bone covered with flesh in the manner required to constitute a perfect shape, it may be concluded that the beast is well fed; especially when his hip-bones, or, as they are sometimes termed, his huckle-bones, are round, his ribs smooth and not sharp, his flanks full, and cod round. When these marks are perceptible, the beast may be handled, and his lowermost ribs felt; if the skin be *kindly* or *mellow*, that is, soft yet firm to the touch, it is certain that he is well fed outwardly, or in other words, upon the bones. Next, the hand may be laid upon his hip or huckle-bones, and if they likewise feel soft, round, and plump, it may be safely concluded that the animal is well fed, both externally and internally; that is, both in flesh and in tallow. Further: he may be handled at the setting on of his tail, which, if it be thick, full, and soft to the touch, is also an indication that the beast is well fed externally; the same circumstance is likewise evinced by the *nach-bones*, which lie on either side of the setting on of his tail, feeling mellow, or soft and loose. Lastly, the cod may be examined, if an ox, or the navel of a cow, and if they respectively feel thick, round, large, and plump, it is a certain criterion that the beast is well tallowed within; though, when any of these parts or members handle contrary to the rules above mentioned, a contrary judgment must be formed.

But, after all the attention and labour which the grazier may bestow, his hopes are liable to be frustrated, in some measure at least, unless he select a proper time for the disposing of his fat cattle. The most common season for beef is at Michaelmas, when the markets are more abundantly and more cheaply supplied than at any other period of the year; as the numerous cattle which have been fattened on luxuriant pasture grounds, are then brought for sale. Hence the attentive grazier will find it most beneficial, at this time, to dispose only of such part of his stock as may be then thoroughly fat, and which, consequently, would not pay for any longer keeping. Beasts are chiefly driven to London for sale; and, where the distance from the metropolis is very considerable, they are liable to very many calamities or accidents on the road, besides their diminution in point of weight; which, even under the eye of the most attentive drivers, is necessarily incurred, and is often great: while the

fluctuation of the markets renders his risk very considerable. It will, therefore, be advisable, where it can be conveniently or advantageously effected, to dispose of fat stock in such markets as are in the vicinity of, or at an easy distance from the farm.

In drawing off one or more lots of cattle for sale, it is the general practice to dispose of the fattest animals, and to keep those which do not fatten kindly for additional exertions. Such procedure may, indeed, as Mr. Young has observed, be admitted to a certain extent, if the food provided be not expensive; but, if the beasts are reserved for corn or cake-feeding, or if the supply of other food is precarious or limited, this conduct is highly questionable. Costly food should on no account be given to cattle that have evinced themselves to be unthrifty; on the contrary, the most thriving animals in the lot ought to be chosen for this purpose; and the pursuance of an opposite conduct has often been the reason why all winter-fattening has been so undeservedly censured. As soon as a grazier is fully convinced that he has a beast which is not kindly disposed to take on fat, or is an *ill-doer*, the *first* loss is obviously the best, and he should dispose of the unthrifty animal the earliest opportunity.

The common mode of selling cattle for slaughter is by *lots*; and, in this case, to prevent confusion between the parties, or loss on the part of the feeder, care should be taken to fix the precise time in which any particular lot is to be drawn, in order that no unnecessary food may be consumed. Formerly, and even now, in some places, it is usual to sell by the *eye*, a method which is certainly unequal as it respects both the farmer and the butcher; for the former, unless he has been accustomed to weigh his beasts during the progressive stages of their fattening, can form at best but an uncertain idea of their weight; while the latter, from his continual practice, is enabled to form a tolerably accurate estimate. Hence some have killed a beast out of a particular lot, with a view to ascertain the average weight of animals in such lot; and, in order to induce a perfect equality between the buyer and seller, it was proposed by the late Lord Kaimes to dispose of every beast by weight, and that such weight should be ascertained by the steel-yard, as being best calculated for weighing heavy goods; which mode he used with ease and success for many years.

With regard to *fat calves*, we would observe that, in general

by weighing the animal alive at the time of sale, and from the gross weight deducting eight pounds from every score, to be allowed to the butcher, the remainder will prove to be the weight of the four quarters. Thus, if a farmer has occasion to ascertain the value of a calf at 8*d.* per pound: properly securing him so as not to hurt the beast, he weighs him with scales or steel-yard, or in a weighing-machine, and finds the weight to be ten score, or 200 lbs. From this weight let eighty pounds, or eight pounds from each score, be deducted; the remainder will be 120 lbs. the weight of the four quarters very nearly; which, at 8*d.* per pound, will be 4*l.*, and so of any other weight or price. As this rule will not, in general vary more than four ounces, or half a pound in a quarter or side, it will be found to answer sufficiently well for the purpose.

It is not, however, sufficient to ascertain the weight of a living fatted beast, or bullock. Different parts of the same animal are different in their value: and there is a rule for ascertaining the proportion of these various parts, by which their weight may be known with almost equal certainty as the weight of the whole beast. But, before we proceed to specify such rule, it is necessary to premise, that the following proportions are calculated chiefly for Scotch cattle, to which only Lord Kaimes's experience reached; but, as great numbers of these are fattened in England, especially in the county of Norfolk, we trust the annexed hints will be found useful.

The four quarters * constitute half the weight of the bullock; the skin is the eighteenth part; the tallow the twelfth part; making twenty-three thirty-sixths, or about two-thirds of the whole; the remaining third part, or a little more, is composed of the head, feet, tripe, blood, &c. which offals never sell by weight, but at a certain proportion of the weight of the beast. They commonly produce from 15*s.* to 20*s.* according to the price of meat; supposing the bullock to weigh about 100 stone of fourteen lbs. live weight. These particulars being adjusted, the next point which the seller is to ascertain is the market-price of butcher's meat, tallow, and hides. Supposing the bullock † to be sold is seventy-two stone living weight, the four quarters

* Kaimes's Gentleman Farmer, p. 209.

† As the weight of beasts varies accordingly as their bellies are more or less full, it is necessary to state, that the proportions above stated were made out when the cattle were weighed at eleven o'clock in the forenoon.

make thirty-six stone, which, at 8*s.** per stone, amount to 14*l.* 8*s.* The hide may be worth 36*s.*; and the tallow, being 8*s.* 4*d.* the stone, is worth 2*l.* 10*s.* sterling. The offals, according to the proportion above stated, will give 15*s.*; and, by that computation, the value of the bullock is 19*l.* 9*s.*; which answers to nearly 5*s.* 6*d.* per stone, living weight. And therefore, if a butcher agree to give that sum per stone, no more is necessary to ascertain the price of the whole carcase than to weigh the beast†.

Such are the rules by which the live-weight of cattle is commonly estimated; but, that they are not always to be relied on, will be sufficiently exemplified by the following *Statement of the live and dead weights, and proportion of offal*, of six oxen of different breeds. They have been selected without regard to a comparison between the breeds; but, being all prime cattle, the account may also afford some data for a judgement on that subject.

	DEVON.				DURHAM‡.			
			st.	*lb.*			*st.*	*lb.*
Live weight			114	0			137	12
	st.	*lb.*			*st.*	*lb.*		
Head and pluck .	5	2			7	7		
Blood, entrails, and feet	13	3			14	11		
Coarse offal . .	18	5			22	4		
Tallow . . .	10	6			11	7		
Hide . . .	6	3			8	0		
			35	0			41	11
Weight of carcase . .		st.	79	0		st.	96	1

* Where prices are mentioned, they are, of course, only nominal.

† For ascertaining differences between venders and purchasers of cattle, we know of few more useful manuals than Renton's "Grazier's Ready Reckoner," (12mo. 2*s.* 6*d.*,) consisting of tables calculated to determine, by admeasurement of a beast's body, the weight of any animal within certain limits, sinking the offal; and accompanied with rules for taking such measurement.

‡ This ox obtained a prize from the Durham Agricultural Society, in 1806.—See *Agricultural Survey of Durham*, pp. 238 and 245.

	HEREFORD.				HEREFORD*.			
			st.	lb.			st.	lb.
Live Weight			95	10			120	3
	st.	lb.			st.	lb.		
Head and pluck .	7	3			9	4		
Blood, entrails, and feet	10	9			32	0		
Coarse offal . .	17	12			41	4		
Tallow . . .	12	6			13	2		
Hide . . .	8	8			9	2		
			38	12			63	8
Weight of carcase . . st.			56	12	st.		56	9

	CROSS-FRENCH AND DEVON. †				HIGHLAND.			
			st.	lb.			st.	lb.
Live Weight			77	12			46	8
	st.	lb.			st.	lb.		
Head and pluck .	4	7			3	3		
Blood, entrails, and feet	10	10			7	10		
Coarse offal . .	15	3			10	13		
Tallow . . .	13	12			5	10		
Hide . . .	6	2			4	9		
			35	3			21	4
Weight of carcase . . st.			42	9	st.		25	4

* This ox obtained the highest prize from the Smithfield Cattle Club, in 1807; but, in taking his dead-weight, the contents of his stomach were not deducted. No fair comparison can, therefore, be drawn between him and the others, as they were all weighed empty; and he is only inserted among them in order to shew the extraordinary difference, in real value, that might arise, if cattle were to be weighed with their stomachs full.

Allowing the true weight of the entrails of this ox to have been 13¼ stone, (which nearly corresponds with the proportionate weight of his fellow Hereford,) then his proportions would have been

	st.	lb.
Dead weight	75	5
	st.	lb.
Dead to live-weight	6	3¼
And of offal to carcase . . .	3	0

instead of as stated in the Summary.

† Both these oxen obtained premiums from the Smithfield Club.

SUMMARY.

Proportion of Carcase to 10 Stones of Live Weight.	st.	lb.		st.	lb.	Proportion of Coarse offal to 10 Stones of Carcase.
	6	13	Devon	2	4½	
	6	13½	Durham	2	1¼	
	5	12½	Hereford	3	2	
	4	10	Ditto	7	2¼	
	4	7⅓	Cross	4	4½	
	5	6	Highland	4	4½	

Thus having attempted to compress into one view the various important facts that are connected with this department of our work, we shall conclude with the two following tables, selected from Lord Somerville's valuable tract, intituled "Facts and Observations relative to Sheep, Wool, Ploughs, Oxen, &c." (8vo. 1803,) in which are exhibited the various weights adopted in different counties and districts for equalizing the different modes of calculation.

TABLE FOR THE EQUALIZATION OF DIFFERENT WEIGHTS.

Scores.	Stones at 14lb.		Stones at 8lb.		Scotch Stones 16lb.		Hundreds, 112lbs.		
	st.	lb.	st.	lb.	st.	lb.	cwt.	qrs.	lb.
20 equal	28	8	50	0	25	0	3	2	8
25 ..	35	10	62	4	31	2	4	1	24
30 ..	42	12	75	0	37	4	5	1	12
35 ..	50	0	87	4	43	6	6	1	0
40 ..	57	2	100	0	50	0	7	0	16
45 ..	64	4	112	4	56	2	8	0	4
50 ..	71	6	125	0	62	4	8	3	20
55 ..	78	8	137	4	68	6	9	3	8
60 ..	85	10	150	0	75	0	10	2	24
65 ..	92	12	162	4	81	2	11	2	12
70 ..	100	0	175	0	87	4	12	2	0
75 ..	107	2	187	4	93	6	13	1	16
80 ..	114	4	200	0	100	0	14	1	4

The weights, *per stone*, commonly used for cattle in different parts of the kingdom, are as follow:—viz.

Smithfield ..... 8lb. of 16oz. each.
N. Country ..... 14lb. do.
Common Scotch ..... 16lb. do.

Glasgow Tron ..... 16lb. of 22 oz.
Ayrshire ..... 16lb. of 24 do.
Dutch ..... 17¼lb. of 16 do.

Of these, the stone of 14lb. is chiefly used in calculating live weight, and that of 8lb. for the carcase.

TABLE OF PRICES.

Per Score of 20lbs.—the difference being calculated at one Farthing per lb.

Scores at	3¾d.			4d.			4¼d.			4½d.			4¾d.			5d.			5¼d.			5½d.			5¾d.			6d.			6¼d.			6½d.			6¾d.			7d.			Difference.		
	l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	*d.*
1	0	6	3	0	6	8	0	7	1	0	7	6	0	7	11	0	8	4	0	8	9	0	9	2	0	9	7	0	10	0	0	10	5	0	10	10	0	11	3	0	11	8	0	0	5
2	0	12	6	0	13	4	0	14	2	0	15	0	0	15	10	0	16	8	0	17	6	0	18	4	0	19	2	1	0	0	1	0	10	1	1	8	1	2	6	1	3	4	0	0	10
3	0	18	9	1	0	0	1	1	3	1	2	6	1	3	9	1	5	0	1	6	3	1	7	6	1	8	9	1	10	0	1	11	3	1	12	6	1	13	9	1	15	0	0	1	3
4	1	5	0	1	6	8	1	8	4	1	10	0	1	11	8	1	13	4	1	15	0	1	16	8	1	18	4	2	0	0	2	1	8	2	3	4	2	5	0	2	6	8	0	1	8
5	1	11	3	1	13	4	1	15	5	1	17	6	1	19	7	2	1	8	2	3	9	2	5	10	2	7	11	2	10	0	2	12	1	2	14	2	2	16	3	2	18	4	0	2	1
20	6	5	0	6	13	4	7	1	8	7	10	0	7	18	4	8	6	8	8	15	0	9	3	4	9	11	8	10	0	0	10	8	4	10	16	8	11	5	0	11	13	4	0	8	4
25	7	16	3	8	6	8	8	17	1	9	7	6	9	17	11	10	8	4	10	18	9	11	9	2	11	19	7	12	10	0	13	0	5	13	10	10	14	1	3	14	11	8	0	10	5
30	9	7	6	10	0	0	10	12	6	11	5	0	11	17	0	12	10	0	13	2	6	13	15	0	14	7	6	15	0	0	15	12	6	16	5	0	16	17	6	17	10	0	0	12	6
35	10	18	9	11	13	4	12	7	11	13	2	6	13	17	1	14	11	8	15	6	3	16	0	10	16	15	5	17	10	0	18	4	7	18	19	2	19	13	9	20	1	4	0	14	7
40	12	10	0	13	6	8	14	3	4	15	0	0	15	16	8	16	13	4	17	10	0	18	6	8	19	3	4	20	0	0	20	16	8	21	13	4	22	10	0	23	6	8	0	16	8
45	14	1	3	15	0	0	15	18	9	16	17	6	17	16	3	18	15	0	19	13	9	20	12	6	21	11	3	22	10	0	23	8	9	24	7	6	25	6	3	26	5	0	0	18	9
50	15	12	6	16	13	4	17	14	2	18	15	0	19	15	10	20	16	8	21	17	6	22	18	4	23	19	2	25	0	0	26	0	10	27	1	8	28	2	6	29	3	4	1	0	10
55	17	3	9	18	6	8	19	9	7	20	12	6	21	15	5	22	18	4	24	1	3	25	4	2	26	7	1	27	10	0	28	12	11	29	15	10	30	18	9	32	1	8	1	2	11
60	18	15	0	20	0	0	21	5	0	22	10	0	23	15	6	25	0	0	26	5	0	27	10	0	28	15	0	30	0	0	31	5	0	32	10	0	33	15	0	35	0	0	1	5	0
65	20	6	3	21	13	4	23	0	5	24	7	6	25	14	7	27	1	8	28	8	9	29	15	10	31	2	11	32	10	0	33	17	1	35	4	2	36	11	3	37	18	4	1	7	1
70	21	17	6	23	6	8	24	15	10	26	5	0	27	14	2	29	3	4	30	12	6	32	1	8	33	10	10	35	0	0	36	9	2	37	18	4	39	7	6	40	16	8	1	9	2
75	23	8	9	25	0	0	26	11	3	28	2	6	29	13	9	31	5	0	32	16	3	34	7	6	35	18	9	37	10	0	39	1	3	40	12	6	42	3	9	43	15	0	1	11	3
80	25	0	0	26	13	4	28	6	8	30	0	0	31	13	4	33	6	8	35	0	0	36	13	4	38	6	8	40	0	0	41	13	4	43	6	8	45	0	0	46	13	4	1	13	4
85	26	11	3	28	6	8	30	2	1	31	17	6	33	12	11	35	8	4	37	3	9	38	19	2	40	14	7	42	10	0	44	5	5	46	0	0	47	16	3	49	11	8	1	15	5
90	28	2	6	30	0	0	31	17	6	33	15	0	35	12	6	37	10	0	39	7	6	41	5	0	43	2	6	45	0	0	46	17	6	48	15	0	50	12	6	52	10	0	1	17	6
95	29	13	9	31	13	4	33	12	11	35	12	6	37	12	1	39	11	8	41	11	3	43	10	10	45	10	5	47	10	0	49	9	7	51	9	2	53	8	9	55	8	4	1	19	7
100	31	5	0	33	6	8	35	8	4	37	10	0	39	11	8	41	13	4	43	15	0	45	16	8	47	18	4	50	0	0	52	1	8	54	3	4	56	5	0	58	6	8	2	1	8
N.B. One half, as above, is	2d.			..			2¼d.			..			2½d.			..			2¾d.			..			3d.			..			3¼d.			..			3½d.								

BOOK THE SECOND.

ON THE ECONOMY AND MANAGEMENT OF THE DAIRY.

CHAPTER I.

OF MILCH KINE.

THE value of the respective breeds of milch kine having been already stated*, it will rest with the farmer to make his selection, according to the nature of the soil in his occupation, and of the particular branch of dairying which he means to pursue: for if his object be to sell the milk, or to suckle calves, quantity must be the material consideration; and quality, if he mean to produce butter and cheese.

It is a general observation, that the richest milk is produced by the red cow, while the black sort is reckoned best for the purpose of breeding, as her calf is usually both stronger and more healthy than the offspring of the red species. This, however, is one of those errors which have been transmitted, through a long series of years, without being founded on fact. The red cows have, indeed, been long celebrated for the excellency of their milk; and the calves of black cows have been proverbially deemed good: but colour in this respect is a matter of no moment; the *breed* alone should claim the farmer's attention. But cows even of the same, and of the best breeds, will not always yield the same quantity of milk; and of those which yield the most, it is not unfrequently deficient in richness. Trials, are, however, easily made, by keeping the cows on the same food, weighing the quantity consumed by each, and measuring their milk; then keeping and churning it, a few times, separately: thus, reckoning the cost of the provender, and the produce of the milk of each, and comparing the result, it will be soon discovered which is the most profitable animal. Comparisons of this kind are not often made; for farmers usually

* See Book I. Chap. I.

purchase whatever stock they can most conveniently, or most cheaply, lay their hands on; and are then content to keep them so long as they turn out tolerably well. This, however, is the height of bad economy; for an indifferent cow will eat as much and require as much attendance, as the best; and thus occasions a daily loss, that will soon exceed any probable saving in the original price; whereas the man who takes the pains to acquire a good stock, and has the sense to keep it, lays the sure foundation of a fortune.

In point of quantity, large cows, of whatever breed, will generally be found to have the advantage over the small ones. In this particular, the Tees-water breed excels; but they require a rich soil, and if the land be not of the best kind, a Suffolk, or a Scotch cow, will be preferable. It is common for cows of the first mentioned breed to give as much milk as thirty quarts a-day; and there are instances of even more; but they are of the old Yorkshire stock, and do not belong to the improved breeds of short horns, and their milk is not considered equal in richness to the Devon or the kyloe.

In order to ascertain their comparative merit, two experiments are recorded to have been made in the county of Durham, by different persons, who each got two ounces of butter from a quart of kyloe milk; while a quart from the short-horned breed produced, in one instance, only one ounce, and in the other but very little more. From a further experiment on six cows of the short-horned improved breed, it however appears, that the product of a quart of milk from each was as follows:

	oz.	dr.
No. 1.....	3	0
2.....	1	6
3.....	1	12
4.....	1	10
5.....	1	14
6.....	1	6

The great difference between No. 1, and the remainder, is accounted for by the age of the former being six years, and that of all the others only two; it being understood that the produce of butter increases up to a certain age *. The result of other trials of the value of the milk of the two breeds, varied, but the quantity was uniformly in favour of the Yorkshire.

* Agricultural Survey of Durham, p. 237.

In one superior Epping dairy, where much attention had been paid to the selection of the stock, the North Devon breed is considered superior to both the short-horned and the Leicester for the richness of the milk, though the quantity is one fourth less; they bear hard living better in the winter, and their calves are found to excel others both in the disposition to fatten, and in the colour and quality of the meat *.

Whatever breed may be selected, there is still a material distinction to be observed between the form of a cow intended for the dairy, and that of one intended for fatting. While the latter should possess, as nearly as possible, all the most remarkable points, already described, of the best oxen, the milch cow should, on the contrary, be thin and hollow in the neck; narrow in the breast and point of the shoulder, and altogether light in the fore-quarter; with little dewlap, and neither full-fleshed along the chine, nor shewing, in any part, much indication of a disposition to put on fat. The hide should be thin, the hair fine, and the tail small. But, especially, the udder should be full and round, yet thin to the touch, and should be of equal size and substance throughout. If it shews more behind than before, it is deemed a sign of the milk falling off soon after calving; and if it feels coarse and lumpy, the bag will be found not to contain a large quantity. The teats should stand square, at equal distances, and should neither be very large, nor very thick towards the udder, but nearly equal, yet ending in a point. Another very material consideration is the temper; for kindly cows will not only give less trouble than those of an opposite disposition: but they are generally remarked to possess a greater quantity of milk; and, from parting with it more readily, they are less subject to fall off in their milking.

CHAPTER II.

OF THE PASTURE AND OTHER FOOD BEST CALCULATED FOR COWS, AS IT RESPECTS THEIR MILK.

As the nature of the grass, or other vegetables, has a very considerable influence both on the quality and on the quantity of

* Agricultural Survey of Essex, Vol. II. pp. 281. 290, &c.

milk which cows produce, the attention of the industrious farmer will, of course, be directed to this point; for, as instances have occurred, where *six* milch kine, fed on some pastures, have yielded as much milk as *nine*, or even a *dozen* will afford on an inferior ground, it is obviously his interest to have his cows well fed and in good condition, rather than to keep up a particular number, without heeding whether they are properly supplied or not. Hence, it will be proper to suit the milch cows to the nature and fertility of the soil; and on no account to purchase them from pastures superior to those destined for their reception.

The feeding of milch kine is divided into two branches, viz. *pasturing* and *house-feeding*.

In order to obtain an abundant supply of good milk, where the pasturing of cows is adopted, they ought uniformly to be well fed; for this purpose, grass growing spontaneously on good, sound meadow land is, in general, deemed the most proper food. Another requisite is, that the grass be plentifully produced, and of that quality which is relished by the cattle. This property will generally be found in old natural pastures that have been properly managed; but in laying down meadow, it has been found very beneficial to sow a mixture of Dutch clover and a little rye grass, or of equal parts of Dutch and white clover, intermixed with a small quantity of rye grass*.

Much attention, however, is necessary, in order to eradicate the crow-garlic, or garlic-hedge-mustard, (which is also known by the provincial names of Jack-by-the-hedge, or garlic-wormwood,) and similar weeds, which, when eaten by cows, uniformly impart a rank flavour to their milk, and consequently to the butter which is made from it. And, as that fluid often becomes bitter, as well as liable to turn at the fall of the leaf, it will also be proper to prevent them, if possible, from eating decayed leaves, by collecting them. It is likewise worthy of note, that though the long, rank grass, growing in orchards or other places, in general feeds well, and produces a flush of milk, yet such milk will neither be so rich, nor carry so much cream in proportion, as the milk of those cows which are fed upon short fine grass; nor, of course, will their butter be so good.

* On this subject, however, as belonging more properly to the business of the farmer than of the mere dairyman, we refer to Books X. and XI.

Further, the quality and quantity of milk is materially affected by driving them to a distance from one pasture to another; hence it will be proper to have the cow-sheds in as centrical a part of the farm as possible. It is also of essential importance to have pastures well sheltered and inclosed, as the produce of milch kine will be greatly improved, or deteriorated, according to the attention or disregard bestowed on this point; for, when confined within proper inclosures, they not only feed more leisurely, and are better protected against bad weather, but are also less liable to disturbance than when they wander into other fields; and both moderate warmth and quiet are mainly conducive to an increase of milk.

With regard to the housing of milch kine during summer, the general practice is, where there are proper inclosures, to send them out in the evening, in order that they may lie out during the warm season. The advantages thence resulting are, that, by breathing a purer atmosphere, they are less susceptible of the vicissitudes of heat and cold, while they are left to eat grass at liberty whether early or late; and it is asserted that they yield more and better milk than if they were confined in a house.

In the winter, however, milch kine are usually fed in houses: but, where the practice of keeping them in stalls does not prevail, it will be proper to have warm sheltered yards, furnished with open sheds, in which they can feed without exposure to the severities of the weather; a measure, of which the expense will be more than counterbalanced by the increased quantity of milk which they will yield.

In the management of milch kine, it is essential that they be, at all times, kept in high health and good condition; for, if they are suffered to fall in flesh during the winter, it will be impossible to expect an abundant supply of milk by bringing them into high condition in the summer. Hence, if cows are lean when calving, no subsequent management can bring them to yield, for that season, any thing like the quantity they would have furnished, in case they had been well kept throughout the winter. During that inclement season, therefore, the most nutritious food should be provided for them, and the animals be kept in warm stables; for beasts will not eat so much when kept warm, as when they are shivering

with cold*; and if they be curried in the same manner, and kept cleanly as horses in a stable, the happiest consequences will ensue, both in regard to the milk they yield, and the rapid improvement of the cows themselves†. Such is the practice pursued in Holland, where it is well known that the management of cows is carried to the highest perfection; and if that be closely followed, if they be well supplied with the purest water, kept very clean, and laid dry, they will produce milk more copiously, and afford a quantity of rich manure that will amply repay the trouble and attention thus bestowed on them. Dr. Anderson, indeed, (whose labours in behalf of useful science are too well known to require commendation,) has stated, that he knew a man who attained to great opulence by attending to these circumstances, and particularly to the important one of having a continued supply of the purest water that could be procured for his milch kine; nor would he, on any account, permit a single animal to set a foot into it, or suffer it to be tainted even by the breath of the beasts. And yet, it is a fact, that cattle frequently prefer the water in ponds impregnated with the urine of other animals: but this probably arises from its containing salts, which instinct points out as beneficial to their health.

It has already been intimated, that the best summer food for cows is good grass, spontaneously growing on sound meadows; but when these are shut up, tares and clover, either cut or pastured, may be very advantageously substituted. The other additions to hay for winter food are those most commonly employed for fatting cattle:—*parsnips* and *carrots*, which roots not only render the milk richer, but also communicate to the butter made from such milk a fine colour, equal to that produced by the most luxuriant grasses:—the *mangel-wurzel*, which, on the continent, is preferred to every other vegetable for feeding cattle in general:—*potatoes*, on which cows will thrive well, so that with one bushel of these roots, together with soft meadow-hay, they have been known to yield as large a quantity of sweet milk, or butter, as they usually afford when fed on the finest pastures; but alone, it has been proved by va-

* Dr. Anderson's Recreations in Agriculture and Gardening, Vol. III.
† Baron d'Alton, in Communications to the Board of Agriculture, Vol. I.

rious experiments that potatoes will not support a cow in milk; they may add to the flow of it when given with hay, but the chief dependence must be upon the latter; carrots are far superior*:—*cabbages* are likewise of eminent service in this respect, but they require to be given with a good portion of fine hay; and, as well as *turnips*, the utility of which is too well known to require any particular detail here, they are apt to impart an unpleasant flavour to butter, unless great care be taken to remove all the decayed leaves:—*fog*, or *rowen* grass reserved for winter use, which is cut and carried to the animals:—pulverised *oil-cake*, *linseed jelly*, and *grains*. By the judicious use of these various articles, together with a due admixture of dry food, considerable nutriment is thrown into the system, while the regular secretions will be excited, and the quality of the milk very materially improved.

In some parts of Flanders, after the corn crops have been reaped, the ground is lightly ploughed, and sown with *spurry*. The cows are tethered on it in October, and a space allowed to each proportioned to the quantity of food that is necessary. The butter from the milk thus obtained, is called *spergule butter*, and is not of equal quality with that produced from the common food†.

The following mode of feeding milch kine is practised, to a great extent, in the county of Middlesex, from which the inhabitants of London chiefly derive their milk. During the night the cows are confined in stalls, and about three o'clock in the morning each has a half-bushel basket full of grains given to her; when the operation of milking is finished, each receives twice that quantity of turnips, and shortly after one truss of the finest, softest, earliest made, and greenest meadow-hay is divided among ten cows. These various feedings are usually made before eight o'clock in the morning, when the animals are turned into the cow-yard. Four hours after, they are again tied up to their stalls, and supplied with the same allowance of grains as they had received in the morning; on the conclusion of the afternoon milking, (which generally continues till near three o'clock,) they are served with a similar quantity of turnips; and in the course of another hour, with a like allotment of hay. This method of feeding usually continues throughout

* See the Agricultural Survey of Sussex, p. 259.

† Sir John Sinclair's Hints on the Agriculture of the Netherlands, &c.

the turnip season, that is, from November to March; during the remaining months they are fed with grains, tares, cabbages, and the proportion of rowen, or second-cut meadow-hay, already mentioned; and are fed with equal regularity until they are turned out to grass, when they pass the whole of the night in the field; and, even, during this season, they are often fed with grains, with which some cow-keepers mix common salt, with a view to preserve them longer in a sweet state. But this practice has much declined, as the proprietors, who tried the experiment, did not meet with an adequate return for their labour and expense *; though it has been asserted, that the mixing of salt with the food of cows (which will eat it with great avidity) both increases the quantity and improves the quality of the milk, while it contributes to promote the health of milch kine.

In Yorkshire, milch cows are allowed the best pastures during summer, and are usually housed about Martinmas, when their food is generally turnips and straw, or where turnips are not cultivated, hay; but a difference is made between those cows which are rather fresh of milk, and those which are nearly dry, the former having a larger portion of turnips, with the addition of hay, whilst the latter are put off with little else than straw until within a few weeks of calving, when hay is allowed †. In Essex the system is nearly the same, except that the produce of the dairy being chiefly butter, turnips are seldom given: rowen hay, as being the softest and the greenest, is preferred, and the consumption is calculated at two loads (of eighteen cwt.) in the winter, with two acres of summer pasture, and some straw while drying off ‡.

In the course of the preceding statements, the *stall*, or *house-feeding*, of cows during the winter in Holland has been mentioned; and, from the remarks of Baron d'Alton §, it appears

* Middleton's Agricultural Report for the County of Middlesex, 8vo. This intelligent reporter further states, that brewers' grains may be preserved, in a sound state, from March till Summer, when brewing is discontinued, by tightly treading them down in pits below the surface of the ground, and covering them with a layer of earth, in order to exclude the air and prevent fermentation. The grains increase the *quantity* at the expense of the *quality* of the milk; but this answers the purpose of the London cow-keepers, to whom quality is a secondary consideration.

† Agricultural Survey of the North Riding of Yorkshire, p. 257.

‡ Agricultural Survey of Essex, Vol. II. p. 271.

§ Communications to the Board of Agriculture, Vol. I.

that this method of feeding is there adopted throughout the year with greater profit than can be obtained from pasturing. The Baron indeed says, that cows must be early trained to the confinement of stall-feeding, otherwise they do not thrive; but, as the advantages of soiling and stall-feeding are so great, there can be no difficulty in adopting it and executing it where it is intended to keep calves of a particular breed, as they may be easily reconciled to the confinement.

Sea-weed has of late years been given to cows by way of *condiment*. Mr. Macallum, a cow-keeper of Edinburgh, gives his milch cows sea-weed in lieu of turnips, when these roots are scarce and dear, particularly in the months of February, March, and April. He uses the *fucus digitatus*, or digitated sea-wrack, and the *fucus serratus*, or serrated sea-wrack, but not the *fucus vesiculosus*, or common sea-weed, lest it should fill the animals with *wind*. Mr. M. begins by parboiling the sea-weed, and giving the cows some of the liquor: when they drink the water, they are offered some of the parboiled weed itself: and, when they eat it parboiled, it is gradually given to them *raw*. He gives each cow, once or twice a day, as much as a person can neatly carry at once between his two hands. These marine plants operate as a gentle laxative, and Mr. M. thinks that their use promotes the health of his cows, and consequently increases the quantity of milk they yield *. This is an interesting fact, well deserving the notice of the attentive farmer on or near the sea coast, particularly in the vicinity of the numerous large and populous places of resort for sea-bathing, where cows are numerously kept; and may prove a useful hint to those who are at a distance from the coast in regard to the employment of common salt.

The use of salt for various agricultural purposes to which it could be profitably applied has hitherto been prevented by the heavy duty on its consumption. That impediment is now, however, removed; and it may, therefore, be expected to become an object of serious attention to every one engaged in husbandry, and more particularly of those engaged in the management of cattle; some of the advantages of its application to which stock may be thus enumerated:

I. It restores the tone of the stomach when impaired by ex-

* Sinclair, Vol. II. Appendix 29.

cess in other food, and corrects the crudity of moist vegetables and grasses in a green state.

II. It helps digestion, keeps the body cool, by which many disorders are prevented; and it destroys botts.

III. It renders inferior food palateable; and is so much relished by cattle, that they seek it with eagerness, in whatever state it may be found, and have been rendered so tame by its use, that if they stray from their pastures, they will return at the usual time for their accustomed allowance.

IV. When given to cows, it increases the quantity of their milk, and has a material effect in correcting the disagreeable taste it acquires from turnips.

It has, in fact, been long used for cattle of all descriptions in the East Indies, in America, and in various parts of Europe, and among other experiments of its effects that have been tried in this country, is one recorded by Mr. Curwen, who employs it largely at his extensive farms, and who gave it from the 19th November, 1817, to the 3d February, 1818, to his stock, in the following proportions, viz.:

Stock.	Number.	Quantity.
Cows and breeding heifers	40	4 ounces
Young and fat cattle	43	3 ..
Working oxen	18	4 ..
Heifers and young oxen ..	21	2 ..
Young calves	20	1 ..

During which time they remained in the highest health *.

Steamed chaff may also be given to milch cows with great advantage. For this important fact in rural economy, the grazier is indebted to the ingenious and persevering experiments of J. C. Curwen, Esq. M. P., whose judicious zeal for the improvement of agriculture is too well known to require any eulogy. He uses a steam-boiler of 100 gallons contents †, on each side of which are fixed three boxes, containing 11 stone each of chaff, (the husks of corn,) which, by being steamed, gains more than *one-third* of its original weight. The steam is conveyed by various stop-cocks into the lower part of the boxes; and thus two or three boxes may be steamed at the

* See the Appendix to Sir John Sinclair's Code of Agriculture, p. 43.

† An Engraving of it is given in the 30th volume of the Transactions of the Society of Arts, from which it obtained the lesser gold medal.

same time; the quantity of fuel required is about 2lbs. for each stone of chaff.

In giving the steamed chaff to the cattle, 2lbs. of oil-cake are mixed with one stone of chaff; and the milch cows and oxen are fed with it morning and evening, having an allowance of one stone at each time. On being taken from the steamer, the food is put into wooden boxes, which are mounted on wheels, to be drawn to the place where it is intended to be used; and the chaff requires to stand sometime before it is fit for use. Mr. Curwen estimates the daily cost of food for each cow as follows:

	Pence.
Chaff, two stone, steaming, &c.....	1
Oil-cake, four pounds	4
1 cwt. of turnips	4
Wheat straw.....	1
Total.....	10

The average of milk on a stock of thirty-six milch cows, was nearly 13 wine quarts, for 320 days; which was sold at *2d.* per wine quart. The calves brought from *2l.* to *5l.* for rearing. The produce is stated by Mr. Curwen to be nearly half clear profit, estimating the manure as equal to the calves. The cows were never suffered to be turned out; and to prevent their being lame, their hoofs were properly pared, and they stood with their fore-feet on clay. One great advantage attending this method was, that most, if not all the milch cows were in such a condition that, with a few weeks feeding after they were dry, they became fit for the shambles, with very little loss from the first cost. As a substitute for chaff and oil-cake, Mr. C. recommends cut hay; which, when steamed, would make a much superior food, and he entertains no doubt would greatly augment the milk, as well as benefit the health and condition of the animals. Of this there can be little question; for straw, or even the corn-husk, which is said to contain more nutriment, can add but little to the product of milk: it may keep store animals from starving, but it will never improve their flesh; and it may be received as an axiom, in feeding all animals, that the value of the food is in proportion to the quantity of nutritive matter contained in its

component parts. Bulk is also necessary to sustain the action of the stomach; but it serves no other purpose.

The strictest attention is necessary to see the cows always kept clean, and never to suffer the least heat to appear upon their skins without an immediate application of black soap and water. They are also to be carded or curried; and care should be taken to keep them in a regular degree of temperature, as any considerable change affects their milking. Mr. Curwen gives cooked food from October to June, nearly eight months out of twelve, and his plan of treatment has been adopted by several farmers in different parts of the kingdom, with the most complete success: it is also partially practised in the Isle of Man, where the cottagers have long been in the habit of pouring boiling water on the chaff with which they winter-feed their cows *.

The plan of feeding adopted by one of the greatest dairy farmers in Scotland, Mr. Ralston, of Wigtonshire, is as follows: Until the grass rises and affords a full bite, the cows are kept in their houses, but are then sent out to pasture. In hot weather they are fed on cut grass, in the house, from six in the morning until six in the evening, and are out at pasture all night. As the soil is dry and sandy, when rainy weather comes house-feeding is discontinued. In harvest, when the pastures begin to fail, the cows are fed partly on second clover, and partly on turnips scattered over their pasture. As the weather turns colder in October, they are housed at night; and in severe weather during winter, also through the day, receiving oat-straw with turnips. These roots are partly stored, and the supplies of them ordered so as to protract the feeding, and when they fail, Swedish turnips and potatoes follow, with dry fodder. Chaff, oats, and potatoes, are boiled for the cows after calving; and the calves get rye-grass and clover-hay during the latter part of the spring.

The cows employed are of the Ayrshire breed, and are said to yield the amount of their own weight and value annually in cheese †.

* Agricultural Survey of the Isle of Man, p. 109.

† Agricultural Survey of Ayrshire, and of Dumfriesshire, Append. p. 645.

CHAPTER III.

OF THE SITUATION AND BUILDINGS PROPER FOR A DAIRY.—DAIRY UTENSILS.

A DAIRY ought, if possible, so to be arranged, that its lattices may never front the south, south-west, south-east, or west;—a northern aspect is the best; but there should be openings on two sides of the building, in order to admit a free current of air. These lattices, which are in every respect superior to glazed lights, may be covered with oiled paper, pasted on pack-thread stretched for that purpose, so as to admit the light, whenever it may be necessary to exclude the cold or wind*.

As the greatest cleanliness is requisite in the various departments of the dairy, it will be necessary to have separate apartments in order to perform its business properly. A *butter dairy* ought to comprise three apartments; one for receiving the milk, another for performing the operation of churning, and a third for containing and cleaning the various utensils. For a cheese dairy, four rooms will be requisite, viz. a milk room, as before, another for making and pressing the cheese, a third for salting it, and a fourth (which may be commodiously placed as a loft over the others) for storing and preserving them until brought to market. Where a dairy is confined to the sale of milk, two apartments will suffice, one for containing the milk as it is brought in, and another for serving it out, scalding the utensils, &c. These various apartments ought to communicate together: and as it is of material importance that the heat be of one uniform temperature, of from fifty to fifty-five degrees of Fahrenheit's thermometer, double walls and a roof have been recommended, leaving a space of one or two feet, or more, between the wall and the lath and plaster. Mr. Marshall, to whose practical skill our pages bear ample testimony, advises the walls to be constructed six feet thick, one foot on the inside to be of brick or stone, the outside to be of sod, and the intermediate space to be closely filled with earth. The

* "Bath Papers," Vol. III.—Lattices in dairies are exempted from the tax on windows, but *not* glazed lights.

roof, which should be of thatch, should be at least three feet thick, and should project completely over the walls on each side: and as all these materials are non-conductors of heat, Mr. M. is of opinion, that a dairy thus built, would, if provided with double doors, preserve the requisite degree of heat above mentioned, throughout the year. Further, the dairy should be neatly paved with stone, or, if this cannot be procured, with red bricks, laid upon a gentle descent, lest any water should stagnate. It will likewise be proper daily to wash the pavement during summer; but great care should be taken to dry it immediately, as damp promotes the putrefaction or turning of milk; and as dairy-houses cannot be kept too cool at that season, it will be of great advantage to build them, if possible, near a cold spring or rivulet.

Further, if a small current could be conducted through the premises, or water were, by means of a pipe, so introduced as to fall from some height on the pavement, and run off in a constant stream, without stagnating, it will be of great advantage, as it will contribute much to preserve the air continually pure, fresh, and cool. But, as the milk itself when brought in warm, will naturally tend to raise the temperature of the milk-room too high, it is recommended to have an ice-house attached to the dairy, especially where the advantage of a current of water cannot be obtained. This should be surrounded with a double wall, or three sides with an interval between them like the dairy. The place for holding the ice should be formed of upright posts, lined with wattled work of wands or close rail-work, leaving a path all round, of two feet and a half in width: round this is to be formed a gutter to carry off the water dropping from the ice. This mode of constructing an ice-house, is not only the cheapest, but also far preferable to the common practice of making cellars under ground, which are both more expensive, as well as liable to mould and rottenness. The structure of such an ice-house, attached to a dairy, would prove much less expensive than is commonly imagined; and by its utility in that, and other respects, would amply compensate the cost.

Where the temperature of the milk-room has become affected by the carrying of newly drawn milk into it, it may easily be reduced to the proper temperature by suspending a small quantity of ice at a considerable height from the floor; and if, during winter, the cold should become too great, a barrel

of hot water closely stopped, or a few hot bricks, placed on the floor or table of the milk-room, will readily counteract its effects. But on no account whatever should a chaffing-dish with burning coals be used, as it will certainly impart a bad taste to the milk.

The UTENSILS of a Dairy comprise pails, sieves, coolers, churns, creaming-dishes, cheese-vats, ladders, and presses: to these should be added a Fahrenheit's thermometer, which should be suspended in a central part of the milk-house. Wood is the material usually employed, and of which in fact the various utensils ought to be invariably made: lead, copper, or brass utensils, as well as earthenware vessels glazed with lead, ought on no pretext whatever to be used; for the acid which is contained in milk, combines with these metals, and forms a poisonous compound with them. Cast iron, though it does not form a poisonous compound with the milk, is by no means unexceptionable, because it does form a compound that may, in a considerable degree, affect or change the taste and quality of dairy products. Of all metallic dishes those invented a few years since by Mr. Baird, of the Shott's iron-works in Linlithgowshire, are perhaps liable to the fewest objections, as the tin with which they are coated is acted upon by the acetic acid contained in milk in a very slight degree. These vessels are made of cast iron softened by annealing in charcoal, so that they will not break by an ordinary fall, turned smooth in the inside, and laid over with a coat of tin to prevent the iron from coming in contact with the milk. These milk dishes are coming into very general use: and Sir John Sinclair pronounces their invention to be one of the greatest improvements in dairy management. They are stated to be kept more easily clean than wooden vessels: and their superior power of conducting heat cools the milk so rapidly, that the Scottish farmers' wives, who have given them a fair trial, affirm, that they throw up *one third more cream* from an equal quantity of milk. They are made at the Shott's foundry from half an English quart to twenty-four quarts in content, and vary in price from one shilling to nine shillings and sixpence *.

* Sir J. Sinclair on the Husbandry of Scotland, Vol. I. pp. 118, 119.—For many of the preceding hints, as well as for most of the subsequent remarks in this chapter, we are indebted to Dr. Anderson's truly valuable "Essay on the Management of the Dairy," as corrected and inserted in the third and

All dairy utensils ought to be most carefully scoured, first with hot water, and afterwards rinsed with cold, and kept in an airy place, in order that every possible degree of acidity may be removed. Should one or two scourings be insufficient, they must be repeatedly cleansed until they become entirely sweet; as the slightest taint or acidity may cause material loss *.

The structure of the churns in common use is too well known to require any description. The tedious manner in which butter and cheese are made by them, having induced several practical mechanics to invent others, which are less expensive, and more speedy in their operation, we have selected two that appear more worthy of notice.

The *first* is the churn manufactured by Messrs. Wright and Co. of Philadelphia, and which is represented in the subjoined cut.

Fig. 1.

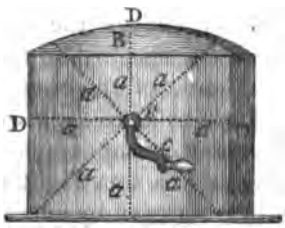
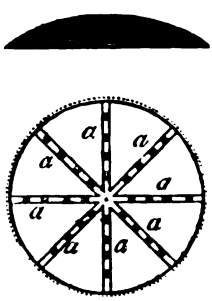


Fig. 2.



It is made in the form of a cube, with vertical dashers, as delineated at *a*, *a*, *a*, *a*, *a*, *a*, *a*, *a*. B is the top, which takes off. C the spindle, or handle, that passes through and turns the dashers, *a*, *a*, *a*, &c. D D D D describe the form of the churn each way. From this mode of construction, considerable power is gained, and much time saved in working the churn, which is a simple and effective contrivance.

The *second* is Mr. W. Bowler's *improved churn*, which, in 1795, was honoured with the notice of, and a premium by, the

fourth volumes of his "Recreations in Agriculture," new Series, to which we now refer once for all.

* It has been lately found that slate makes very good milk coolers, and in some of the midland counties the common flag slate is employed for the purpose.

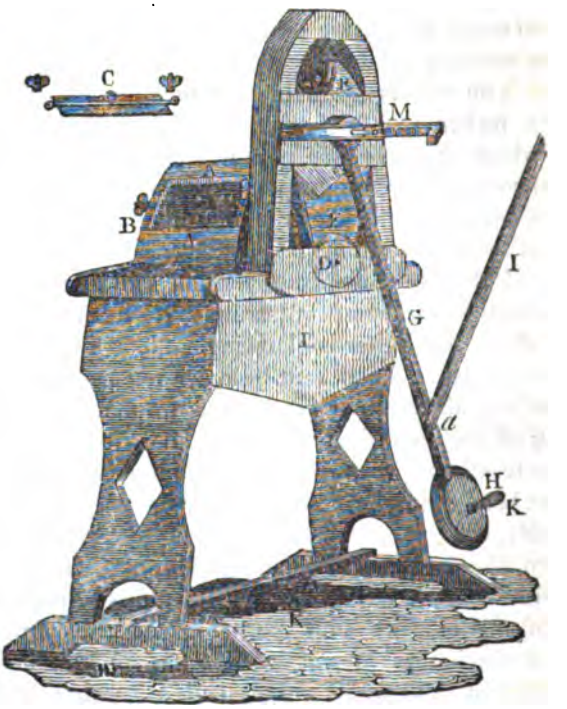
Society for the Encouragement of Arts, &c. already mentioned in the course of this work *.

Mr. B.'s improved churn is of the barrel kind, being a cylinder, eighteen inches in diameter, and nine inches wide. The sides are of *wood*, though we conceive *tin* would be a better substitute, on account of the greater ease with which it may be cleansed. The rim is a tin plate, which has two openings; one, eight inches and a half long by four inches in width, through which the cream is poured into the churn, and the hand is introduced for the purpose of cleansing it; the other, a short pipe one inch in diameter, through which the butter-milk runs out of the churn, when the process of churning is finished. The first of these openings is furnished with a wooden cover, fastened down by means of two screws; and to the other a cork is fitted, while the butter is churning. Near the larger opening, there is also a small vent-hole, with a peg to admit the passage of any air that may be evolved from the cream at the beginning of the operation. Farther, an axle passes through the churn terminating in two gudgeons, on which it hangs; its lower part being plunged in a trough, for the purpose of holding, occasionally, cold or hot water, according to the season of the year. On the inside of the rim are four projecting pieces of wood, with holes, with which the cream is agitated by the motion of the churn. This motion is caused by a pendulum, three feet six inches in length, that has an iron *bob* of ten pounds weight, and at its upper end a turning pulley, ten inches in diameter, from which a rope goes twice round another pulley, about three inches in diameter, that is fixed on the axis of the churn, which it causes partially to revolve by each vibration of the pendulum.

Besides, the machinery is provided with sliding covers, and the water-trough has another, for the purpose of securing the steam, when hot water is used; and for keeping the cream in a proper degree of warmth. The motion of the pendulum is given and kept up by means of a wooden rod, about three feet nine inches long, which turns on a pin about three inches above the bob of the pendulum. An accurate view of the mechanism

* Other improved churns are delineated and described in the 26th and 30th volumes of the Society's Transactions; to which want of room compels us to refer the reader.

above noticed will, it is hoped, be found in the annexed figure of Mr. Bowler's improved churn.



The letters A A designate the body of the churn, which may be made of tin, for the reason already assigned.

B, the opening through which the cream is poured in.

C, the cover of the large opening: the small aperture on the opposite side cannot be represented in the cut.

D, the axis, or gudgeon, on which the body of the churn is suspended.

E, the upper or larger pulley.

F, the smaller pulley, which is fixed on the axis of the churn.

G, the rod of the pendulum, hanging from the upper pulley E.

H, the *bob* of the pendulum.

I, the handle, moveable on the pin at *a*, by which the pen-

dulum is moved, making a traverse in the form of the dotted line K K.

L, the trough for receiving hot or cold water, according to the season, and which may be preferably made of tin, because that metal is a better conductor of heat than wood.

M, a projecting piece of wood, with a shoulder, that supports the handle I, when the churn is not at work.

CHAPTER IV.

OF THE MANAGEMENT OF MILK AND CREAM, AND THE MAKING AND PRESERVATION OF BUTTER.

THE quality of cows' milk greatly depends on the nature of their food, which likewise materially affects the quantity they will yield; though this last circumstance is, in some measure, regulated by the manner of milking them. It will, therefore, be necessary to be very cautious in choosing milkers; because, if a cow be roughly handled, it is not only painful to her, but will also cause her to withhold her milk, which is often attended with serious consequences; whereas, if it be gently drawn, she will yield it freely: and it is of importance that it be drawn to the last drop, for it will otherwise decrease at each succeeding meal. As it sometimes happens that cows are *ticklish*, they should, on such occasions, by no means be harshly or severely treated; and if the udder be hard and painful, it ought to be fomented tenderly with luke-warm water, and stroked gently, by which simple expedient she will be brought into good temper, and yield her milk with pleasure and freedom. It is also proper to feed the cows at the time of milking, for, while eating, they give out their milk with greater freedom, and they are prevented, by the motion of their jaws, from the common, and very pernicious trick of withholding their milk; by which means, if not promptly prevented, they will soon become dry.

In this country, it is the general practice to milk cows twice in the course of twenty-four hours, throughout the year; but, in summer, the proper periods are at least three every day, and at intervals as nearly equidistant as possible, viz. in the morning,

at noon, and a little before the approach of night. For it is a fact, confirmed by the experience of those who have tried it, that cows, when milked thrice in the day, will yield more milk in point of quantity, and of as good, if not better, quality, than they will under the common mode of milking only on the morning and evening.

After the milk is drawn from the cow, it should be carefully strained through a gauze or linen cloth, stretched on an open-bottomed wooden bowl, or a hair-sieve, or through a sieve made of silver wires, on account of its superior wholesomeness, into the cream-dishes, which should never exceed three inches in depth, though they may be made so wide as to contain any quantity required, and which ought to be perfectly clean, sweet, and cool. If any ill flavour is apprehended from the cows having eaten turnips, &c. the addition of one-eighth part of boiling water to the milk, before it is poured into the dishes, will effectually remove it; and, when filled, the dishes ought to be set upon shelves, or dressers, there to continue till the cream is removed*. This should be steadily done by means of a skimming dish, (if possible without spilling any upon the floor, because it will speedily taint the air of the room,) and the cream poured into a vessel, till enough be obtained for churning. When the cream has been collected, it should be put into a deep covered vessel; for the action of the air on the surface dries it; and it should be well stirred with a stick or spoon, once or twice a day, until made into butter; the time of keeping depending on the weather.

With regard to the process of making butter, we would observe:

I. The milk first drawn from a cow is always thinner, and inferior in quality to that afterwards obtained; and this richness

* Mr. Young has recommended the dairy-man to boil two ounces of nitre in one quart of water, and to bottle the mixture; of which, when cold, a large tea-cup full is to be added to ten or twelve quarts of milk as soon as it comes from the cow: the quantity of saltpetre is to be increased as the turnips become stronger. The feeding of cows with the *roots alone* will, as the Earl of Egremont found, prevent the milk from having a bad taste. Another method of removing any ill flavour, arising from the cows having eaten turnips, consists in warming the cream, and afterwards pouring it into a vessel of cold water; from which the cream is to be skimmed as it rises to the surface, and thus the unpleasant taste will be left behind in the water.

increases progressively to the very last drop that can be drawn from the udder.

II. The portion of cream rising first to the surface, is richer in point of quality, and greater in quantity, than that which rises in the second equal space of time, and so of the rest; the cream continually decreasing, and growing worse than the preceding.

III. Thick milk produces a smaller proportion of cream than that which is thinner, though the cream of the former is of a richer quality. If thick milk, therefore, be diluted with water, it will afford more cream than it would have yielded in its pure state, though its quality will at the same time be inferior.

IV. Milk carried about in pails, or other vessels, agitated and partly cooled before it be poured into the milk-pans, never throws up such good and plentiful cream as if it had been put into proper vessels immediately after it came from the cow.

From these fundamental facts, many very important corollaries, serving to direct the practice, may be deduced, among which we can only notice the following:

I. It is evidently of much importance, that the cows should be always milked as near the dairy as possible, to prevent the necessity of carrying and cooling the milk before it be put into the dishes; and as cows are much hurt by far driving, it must be a great advantage in a dairy-farm to have the principal grass fields as near the dairy or homestead as possible. In this point of view, also, the practice of feeding cows in the house, rather than turning them out to pasture in the field, must appear to be obviously beneficial.

II. The practice of putting the milk of all the cows of a large dairy into one vessel, as it is milked, there to remain till the whole milking be finished, before any part is put into the milk-pans, seems to be highly injudicious, not only on account of the loss sustained by the agitation and cooling; but also, and more especially, because it prevents the owner of the dairy from distinguishing the good from the bad cow's milk, so as to enlighten his judgment respecting the profit that he may derive from each. Without this precaution, he may have the whole of his dairy-produce greatly debased by the milk of one bad cow, for years together, without being able to discover it. A better practice, therefore, would be, to have the milk drawn from each cow separately, put into the creaming-pans as soon as milked, without being ever mixed with any other; and if

these pans were all made of such a size as to be able to contain the whole of one cow's milk, each in a separate pan, the careful *dai* * would thus be able to remark, without any trouble, the quantity of milk afforded by each cow every day, as well as the peculiar qualities of the cow's milk. And if the same cow's milk were always to be placed on the same part of the shelf, having the cow's name written beneath, there never could be the smallest difficulty in ascertaining which of the cows it would be the owner's interest to dispose of, and which he ought to keep and breed from.

A small quantity of clear water, cold in summer, and warm in winter, put into the bottom of the milk-pan, is said to assist the rising of the cream.

III. If it be intended to make butter of a *very fine quality*, it will be advisable, not only to reject entirely the milk of all those cows which yield cream of a bad quality, but also, in every case, to keep the milk that is first drawn from the cow, at each milking, entirely separate from that which is got last; as it is obvious, if this be not done, the quality of the butter must be greatly debased, without much augmenting its quantity. It is also obvious, that the quality of the butter will be improved in proportion to the smallness of the quantity of the last-drawn milk which is used, as it increases in richness to the very last drop that can be drawn from the udder at that time; so that those who wish to be singularly nice, will do well to keep for their best butter a *very small* proportion only of the last-drawn milk.

It is a matter of some importance, to determine in what way the inferior milk, which is thus set apart when *fine butter* is wanted, can be employed with the greatest profit. In the Highlands of Scotland, the people have adopted a practice, merely from considerations of convenience and economy, without thinking of the improvement of the butter, which answers many good purposes. As the rearing of calves is there a principal object with the farmer, every cow is allowed to suckle her calf with a portion of her milk, the remainder only being employed for the purposes of the dairy. To give the calf the proportion allotted to it regularly, it is separated from the cow, and put into a small inclosure made for the express purpose, on every farm, of confining all the calves belonging to that farm. At regular

* A provincial word, denoting the person who has the chief concern in a dairy.

times the cows are brought to the door of this inclosure, where the young ones fail not to meet them. Each calf is then separately led out, and runs directly to its mother, where it is allowed to suck till the dairy-maid judges that it has had enough; it is then separated, the legs of the mother having been previously shackled, by a very simple contrivance, to oblige her to stand still, and the dairy-maid milks off what was left by the calf. They proceed in this manner till the whole of the cows are milked, and thus do they obtain a small quantity of milk, it is true, but that of an exceedingly rich quality; which, in the hands of such as know how to manage it, is manufactured into the richest marrowy butter that can be anywhere met with. This richness of the Highland butter has been long remarked, and has been universally ascribed to the old grass that the cows feed upon in those remote glens; but it is in fact chiefly to be attributed to the practice here described, which has long prevailed in those districts.

Other uses might be found for the milk of inferior quality: it might be converted into butter of a secondary value; or might be sold daily, where the situation of the farm is within reach of a town; or it might be converted into cheese, which, if made with care and skill, from the sweet milk alone, would be sufficiently good for common consumption.

With respect to the *operation of churning**, we would particularly remark, that it ought to be regularly continued, till the butter is *come*, or formed; nor, unless from absolute and irremediable necessity, should any assistant be allowed to churn; because, if the motion be, in summer, too quick, the butter will in consequence ferment and become ill-tasted; and, in winter, it will *go back*. The business of churning may, however, be much facilitated, by immersing the pump-churn (if such be employed) about one foot deep into a vessel of cold water, and continuing it there till the butter is made. Where other churns are made use of, the addition of one or two table-spoonsfull of distilled vinegar, after the cream has been considerably agitated, will, it is said, produce butter in the course of an hour. After the butter is formed, the usual practice is to wash it in several waters till all the milk is removed; but some advise the milk to be

* For descriptions and figures of useful churns, see pp. 124—127.

forced out of the cavities of the butter by means of a flat, wooden ladle, furnished with a short handle, at the same time agitating the butter as little as possible, lest it become tough and gluey. The beating of butter up by the hand is an indelicate practice; and, as it is hurtful to the quality of the butter to pour cold water on it during this operation, the butter, if too soft to receive the impression of the mould, may be put into small vessels, and these be permitted to float in a trough of cold water beneath the table, *without wetting the butter*, which will soon become sufficiently firm. Or, when butter is first made, after as much of the milk has been got out as possible, it may be thinly spread on a marble slab, and the remaining moisture be absorbed by patting it with clean dry towels.

On the *making up of butter*, and particularly on the admission of water, whether warm or cold, into the churn, the following pertinent observations occur, in the Agricultural Survey of Sussex, on the dairy system of that county *:—"Water is well known to be a great dissolvent; at least, if it be not essentially so, it serves as a conductor to air, which is universally such. Fresh butter then, in consequence of imbibing water, and water being saturated with air, is always in a progressive state of decay. Not so when water is excluded; its oleaginous parts are admirably calculated to secure it from putrefaction: and it is not improbable that butter might be made with as little trouble as the present method, to keep the whole year fresh and sweet, with the least particle of salt, solely by the exclusion of water. In order to effect this, the floor of the dairy should be kept perfectly dry, for water thrown down in hot weather will assuredly rise again in steam, and affect the milk with its humidity. The vessels used for holding the milk, the churn, and all the dairy utensils, after being first washed clean, should then be rinced a first and second time with sweet milk,—a cruet, washed ever so clean with water, will cause vinegar to become dreggy; but if rinced with a little of the same, will always appear limpid and clear. No water to be put in with the cream when it is churned. The butter, as it is taken out, to be put into a tray, full of holes, and placed over any other vessel; but not to be squeezed into lumps, as it will drain the better for being loose in its texture. It

* Pp. 258 and 259.

should then (after having well drained) be removed to a tray without holes, and be kneaded with the hands (first rinced in whey) and formed into a thin flat cake, slightly sprinkled with salt, and left in that state for about half an hour; by which time the salt will have extracted the whey, and it may be made up in the usual manner."

Butter, thus freed from the remaining milk, is called *fresh butter:* and, when sold on the spot, or in neighbouring markets, it is formed into rolls weighing half a pound or a pound, or into lumps of 24 ounces, termed *dishes* in Somersetshire and some other parts of England. But where it is intended to be kept, or sent to a distance, it is salted by the process immediately to be described, and is put into casks, which contain respectively 28, 56, or 84 lbs., and usually denominated half firkins, firkins, and tubs. Previously to putting the butter into these vessels, especial care must be taken that they be well seasoned by frequent washing and exposure to the air for two or three weeks. As it is very difficult to season *new* firkins, it will always be preferable to employ those which have been already used, where these can be returned to the dairy-owner. The most speedy method of seasoning firkins is, by the use of unslaked lime, or a large quantity of salt and water well boiled; with which they should be repeatedly scrubbed, and afterwards thrown into cold water, to remain there three or four days till wanted. They should then be scrubbed as before, and well rinsed with cold water; and, before the butter is put in, *every part* of the inside of the firkin must be well rubbed with salt.

The ordinary process of *salting butter*, after the milk has been forced out of it in the manner already described, is, to work into the butter one or two ounces of salt, so thoroughly that it shall be equally incorporated with the mass. The salt employed for this purpose should be of the purest kind, well dried and broken down, but not completely pulverized. Dr. Anderson, however, recommends the following preparation, which he has experienced to be much superior, as it not only prevents the butter from becoming in any degree tainted or rancid, but also improves its look or appearance, while (what is of more importance) it imparts a sweeter and richer taste than could have been effected by the use of common salt only. Let two parts of the best common salt, sugar and saltpetre of each one part, be completely blended together by beating, and add

one ounce of this mixture to every pound of butter; incorporate it thoroughly in the mass, and close it up for use. It will be necessary, however, to keep butter, thus prepared, for two or three weeks before it is used, otherwise it will not taste well; but, if properly cured according to the hints above given, Dr. A. states, that it will continue so perfectly sweet for three years, as not to be distinguished from newly-made and salted butter. The best butter is that made during the summer; but by adding a certain portion (which experience only can determine) of the juice expressed from the pulp of carrots to the cream previously to churning, winter-made butter will acquire the appearance and flavour of butter that has been churned during the prime part of the summer season.

When butter is to be exposed to the heat of a warm climate, it should be purified by melting, before it be salted and packed up. For this purpose, Dr. Anderson directs it to be put into a proper vessel, and this into another containing water, which must be gradually heated until the butter be thoroughly melted. In this state it must continue for some time, when the impure parts will subside, and leave at the top a perfectly pure transparent oil; which, on cooling, will become opaque, and assume a colour nearly resembling that of the original butter, except that it will be a little paler, and of a firmer consistence. This refined butter is then to be separated from the dregs, salted, and put up in the same way as the other butter: it will continue much longer sweet in hot climates, as it retains the salt better. Dr. Anderson further states, that butter may be preserved sweet without salt, by adding a certain quantity of fine honey, in the proportion of one ounce of the latter to a pound of butter, and mixing them thoroughly, so that they may be perfectly incorporated. A mixture of this sort has a sweet pleasant taste, and will keep for years without becoming rancid.

In different counties there are several variations in the making of this primary article of domestic consumption; and among these, the following method of preparing it, which is peculiar to the counties of Somerset, Cornwall, and Devon,—where it is termed *clotted*, or *clouted cream*,—is too interesting to be omitted. The milk, when twenty-four hours from the cow, is put into a kettle over a slow fire, which should be hot enough to bring it *very near* to the boiling point in about *two hours*, and not less. A person (usually a child) is set to watch it; and,

the moment a bubble rises to the top, formed by the vaporized milk, the whole is taken off, and set to rest for twenty-four hours more. At the end of this time, if the quantity of milk be considerable, the cream will be an inch or more thick upon the surface. It is now divided with a knife into squares of a convenient size, and removed. The milk, remaining after the cream is taken off, contains little beside the watery particles in its original composition. The dairy-women, in the above mentioned counties, say that milk, thus treated, will yield *one-fourth* more butter than is produced in the common way, and that a few strokes of the churn will form such cream into excellent butter. At present this cream is chiefly confined to the breakfast-table; it is excellent for use with coffee, but when put into tea, it injures its taste, by being instantly converted partially into butter which rises to the surface: when prepared as above, it will keep somewhat longer than common cream.

In the neighbourhood of *Epping*, which has long been famous for the quality of its butter, the following is the common process:—the milk, after standing twenty-four hours, is fleeted, and the skimmed milk is drawn off from the leads into vessels of an increased depth, which is called *doubling*. There it remains for twelve or twenty-four hours more, as the weather permits, during which time, as the cream rises, it is fleeted two or three times. It is then *trebled*, or put into deep tubs, where it is occasionally skimmed, and kept so long as any appearance of cream is found to form on the surface. The butter made from these after-fleetings is, however, of a paler colour and inferior quality to that made from the first cream; it is, therefore, usually churned apart. In making the first quality, when the butter is come, the dairy-woman throws it first into clear water, and then upon a board, and with her hand squeezes out all the water; sprinkling, at the same time, a little salt over the whole mass, which is then divided into pounds, and they, as they are weighed, are again squeezed and rolled out to the length of about fourteen inches. So far, the method nearly accords with that in most other districts; but there is this peculiarity in the management of the Epping dairy-women, that they consider a small proportion of acid, either natural or artificial, necessary to ensure a good churning; for which purpose they either mix sour cream with the sweet, or they employ lemon juice, and sometimes rennet. The practice merits attention on dairy farms

which possess pasture of a short and sweet nature; but where the herbage is coarse, or the cows are fed on roots, or other succulent artificial food, the fresher the cream is churned, the better will be the butter.

In Ireland, where the butter is generally of very fine quality, the common method is, to churn the milk and cream together: the milk being allowed to stand so long as it wheys on the top. It is thus said to produce more butter than in the usual mode of churning the cream alone; and the butter-milk is preferred, by those who are accustomed to it, to skim-milk: but this process excludes the making of skim-milk cheese, and the butter-milk is said not to be equal to skim-milk in fattening pigs.

CHAPTER V.

OF THE MAKING AND PRESERVATION OF CHEESE.

THE goodness of cheese, as well as of butter, depends much on the quality of the milk; though the season, and particular process adopted in making it, also, have a very considerable influence upon it in this respect—more perhaps than the material of which it is prepared. We shall, therefore, briefly notice these circumstances; and, as different modes of making cheese are practised in different counties or places, we shall then concisely state those which are more particularly deserving of notice.

The best *season* for this purpose is from the commencement of May till the close of September; or, under favourable circumstances, till the middle of October; during which interval cows are, or can in general, be pastured. In many large dairies, indeed, cheese is often manufactured all the year round; but the winter cheeses are much inferior in quality to those made during the summer months; though there is no doubt but that good cheese may be made throughout the year, provided the cows be well fed in the winter.

With regard to the *rennet*, as no good cheese can be made without it, great attention is necessary in preparing it for coagulating the milk. Strictly speaking, rennet is the coagulated lacteous matter, or substance, found in the stomachs or maws of calves that have been fed only with milk, and which was formerly used in coagulating milk; though it is, in a more extensive sense, applied to the *bait*, *vell*, *maw*, or *stomach*, as it is variously termed, which possesses the same properties; and which is now invariably used for that purpose.

Dairy women usually preserve the maw, and the curd contained in it, after salting them, and then, by steeping this bag and curd, make a rennet, to turn their milk for making cheese. But a more simple method, and which is equally good in every respect, is to throw away the curd, and, after steeping it in pickle, stretch out the maw upon a slender bow inserted into it, which will soon be very dry, and keep well for a long time. Take an inch or two of the maw thus dried, and steep it overnight in a few spoonsfull of warm water, which water serves full as well as if the curd had been preserved for turning the milk. It is said, that one inch will serve for the milk of five cows.

An ingenious writer, who has made strict inquiry into this subject, recommends the following method of preparing a rennet, which he has found to be better than any other:—"Throw away the natural curd, which is apt to taint and give the bag a bad smell; then make an artificial curd, or rather butter, of new cream, of sufficient quantity to fill the bag. Add three new-laid eggs well beaten, one nutmeg grated fine, or any other good spice; mix them well together, with three tea-cups full of fine salt; fill the rennet-bag with this substance, tie up the mouth, lay it under a strong brine for three days, turning it over daily. Then hang it up in a cool and dry place for six weeks, and it will be fit for use. When it is used, take with a spoon out of the bag a sufficient quantity of this artificial butyrous curd for the cheese you purpose to make, dissolve it in a small quantity of warm water, and then use it in the same manner as other rennet is, mixed with the milk for its coagulation."

But, whatever kind of rennet the dairy-woman may choose to prepare, it should be remembered, that this animal acid is extremely apt to become rancid and putrescent, and that great care is necessary to apply a sufficient quantity of salt to pre-

serve it in its best state; because the rank and putrid taste, occasionally found in some of our English cheeses, is owing to a putridity in the *rennet*. The following mode of preserving it in a sweet state, as practised in the West of England, may not be undeserving of attention. When the rennet-bag is fit for the purpose, let a strong solution of salt be made with two quarts of sweet soft water, and add to this small quantities of almost every indigenous and foreign aromatics and spices that can be obtained. Boil the whole gently, till the decoction is reduced to three pints, over a clear fire, if possible, or at all events, so that it may not become smoky; next, let the liquor be carefully strained, and poured, in a tepid state, upon the rennet-bag. A lemon may now be sliced into it; and, after the whole has stood at rest for one or two days, it may be strained and bottled. If well corked, it will retain its goodness for a year, or even longer, and will communicate an agreeably aromatic flavour to the cheese that may be made with it. In a case of emergency, or where no good rennet can be procured, a decoction of the yellow flowers of the *cheese-rennet*, or yellow lady's bed-straw, (*Galium verum*, L. which blossoms in July and August,) will answer every purpose for coagulating milk. Or, the marine acid in the hands of a judicious person, may be employed for this purpose, as is practised in Holland.

Cheshire cheese. The evening's milk is set apart till the following morning, when the cream is skimmed off, and poured into a brass pan heated with boiling water, in order to warm: one third part of that milk is thus heated. The new milk, obtained early in the morning, and that of the preceding night, being thus prepared, are poured into a large tub, together with the cream. To this is put a piece of rennet, which had been kept in warm water since the preceding evening, and in which a little Spanish annatto (the weight of a quarter of an ounce is enough for a cheese of sixty pounds) is dissolved *. The whole is now stirred together, and covered up warm for about half an hour, or till it becomes curdled; it is then turned over with a bowl, to separate the whey from the curd, and shortly

* Marigolds, boiled in milk, are also used for colouring cheese; to which they also impart a pleasant flavour. In winter, carrots scraped and boiled in milk, afterwards strained, will produce a richer colour; but they should be used with moderation, on account of their taste.

after broken very small. After standing a little time the whey is taken from it, and the curd sinks to the bottom, where the whey is expressed from it; as soon as the curd becomes a little more solid, it is cut into slices and turned over repeatedly, to express all the remaining whey, and is again pressed with weights. Next, the curd is removed from the tub, broken by hand into small pieces—in which state it is termed *gurth* in North Britain—and put into a cheese-vat, where it is strongly pressed both by hand and with weights, in order to extract the remaining whey. After this it is transferred to another vat, or into the same, if it be previously well scalded, where the same process of breaking and expressing is repeated, till all the whey is squeezed from it. The cheese is now turned into a third vat, previously warmed, with a cloth beneath it, and a tin hoop or binder put round the upper edge of the cheese, and within the sides of the vat, the former being previously enclosed in a *clean* cloth, and its edges placed within the vat. These various processes occupy about six hours, and eight more are requisite for pressing the cheese, which, during that time, should be twice turned in the vat, around which are passed thin wire skewers, and frequently shifted. The following morning and evening it must be again turned and pressed; and also on the third day, about the middle of which it is removed to the salting chamber, where the outside is well rubbed with salt, and a cloth binder passed round it. Here the cheese is for nearly a week turned about twice in the day, then left to dry for two or three days, during which period it is turned once, and cleaned each day. Lastly, it is deposited in the cheese or store room, (which ought to be moderately warm, and sheltered from the access of air, lest the cheese should crack,) and turned every day, till it become sufficiently hard and firm*. They require to be kept a long time; and if not forced by artificial means will scarcely be sufficiently ripe under two or three years, or even more. The Dutch make their cheese nearly in the same manner, excepting that they substitute the marine acid, or spirit of sea-salt, which imparts to *Dutch cheese* the

* The cheese-rooms in Cheshire are generally placed over the cow-houses on a floor strewed with rushes. This is done, in order to afford them, from the heat of the cattle below, that uniform and moderate degree of temperature, which is deemed essential to the proper ripening of cheese.

peculiarly sharp and salt flavour for which it has long been remarked; and that they leave out the cream.

Dunlop cheese is made in the county of Ayr, of various sizes, from twenty to sixty pounds.—After the milk is brought to a certain degree of heat, (about 100 degrees of the thermometer upon an average, though in summer ninety will be sufficient, as, on the contrary, during winter, a higher degree will be requisite,) it is poured into a large vessel, where the rennet is added to it, and which is closely covered up for a short time, perhaps ten or twelve minutes. If the rennet be good, it will have effected a coagulation of the milk, which is gently stirred, when the whey begins immediately to separate, and is taken off as it gathers, until the curd become tolerably solid. It is then put into a *drainer*, (a vessel made for the purpose, the bottom of which is perforated with small holes,) and the cover of which is pressed down with any convenient weight. After it has thus stood for some time, and is pretty dry, it is returned into the first vessel or dish, where it is cut into very small pieces by means of a cheese-knife, which is furnished with three or four blades, fixed on prongs from the handle, that cut in a horizontal direction; it is then salted, and properly mixed by the hand. Lastly, it is put into a *cheesitt*, or stout dish with iron hoops, which has a cover that goes exactly into it: a cloth being placed between the curd and the vessel. In this state it is submitted to the action of the cheese-press, when it is occasionally taken and wrapped in dry cloths, till it has completely parted with the whey. When this is suspected to be the case, the cheese is laid aside for one or two days, when it is again examined; and, if there be any appearance of whey remaining, the pressure and application of cloths are repeated. As soon as it is ascertained that the whey is extracted, the cheese is laid out, either on boards made for the purpose, (and which are or should be of the same breadth as the cheese,) or on a deal floor, in order to ascertain whether any whey runs from them, for no cheese will keep well while any whey remains, and if any part become sour, the whole cheese will acquire a disagreeable flavour and smell; or, if an immoderate quantity of rennet be used, it will produce similar effects, and also blow up the cheese full of small holes; which last effect will also result from suffering the cheese to continue too long on one side. After the cheese is cured, various modes are

adopted in polishing them for sale, which are rather injurious than beneficial; nothing farther being requisite, besides turning them, than to rub them occasionally with a coarse cloth, especially after harvest, because at that time they tend to breed mites*.

Gloucester cheese. In making this sort of cheese, as well as the other kinds of thin, or *toasting-cheese*, known as the *Trent-side* and *Cottenham*, the milk is poured into the proper vessel, immediately after it has been drawn from the cow; but being thought too hot in the summer, it is lowered to the due degree of heat by the addition of skimmed milk; or, if that will not do, by pouring in water. When the curd is *come*, it is broken with a double cheese-knife, and also with the hand, to separate it from the whey which is laded off. The curd is then put into vats, which are submitted to the action of the press for ten minutes or a quarter of an hour, till the remaining whey is extracted. It is next removed into the cheese-tubs, again broken small, and scalded with a pailfull of water, lowered with whey in the proportion of three parts of water to one of whey, and the whole is briskly stirred. After standing a few minutes for the curd to settle, the liquor is strained off, and the curd collected into a vat, and, when the latter is about half full, a little salt is sprinkled over and worked into the cheese. The vat is now filled up, and the whole mass of cheese turned twice or thrice in it, the edges being pared, and the middle rounded up at each turning. Lastly, the cheese is put into a cloth, and, after undergoing another pressure, it is carried to the shelves, where it is turned, in general, once a day, till it become sufficiently close and firm to admit of its being washed. The only material difference is, that Gloucester and Trent-side are rather thicker than the Cottenham—which is not more than an inch and a half in depth, and is therefore sooner ready for the table than the others; and that the latter is put together rather hotter than the two former.

Much of what passes under the names of *Double Gloucester*, and of *Cheddar Cheese*, is made in Somersetshire, by the following simple process:—

When the milk is brought home, it is immediately strained into a tub, and the rennet is added, in the proportion of about

* Farm. Mag. Vol. IV. p. 381.

three table-spoonsfull to a quantity sufficient for a cheese of twenty-eight pounds; after which it remains undisturbed for about two hours, when it becomes curd, and is broken. That done, three parts of the whey are warmed, and afterwards put into the tub for about twenty minutes: the whole whey is then again put over the fire, made nearly scalding hot, and returned into the tub, to scald the curd, for about half an hour, after which part of the whey is again taken out, and the remainder left with the curd until it is nearly cold. The whey is then poured off, the curd broken very small, put into the vat and pressed, remains there nearly an hour, and is then taken out, turned, and put under the press again till evening; when it is turned, and put in again until the next morning. It is then taken out of the vat, salted, put into it again with a clean dry cloth round it, and remains in the press till the following evening, when it is again taken out, salted, put into the vat without a cloth, and pressed till the next morning: it then finally leaves the press, and is salted once a day for twelve days*.

Stilton Cheese has only been introduced since about the middle of the last century. It was first made by a Mrs. Paulet, who resided in the Melton quarter of Leicestershire, but who, being a relation of the landlord of the Bell Inn, at Stilton, on the great North road, supplied his house with cheese of such a singularly superior quality, that it became in demand beyond the consumption of the house, and was then sold so high as half-a-crown a pound†. It thus acquired the name of Stilton Cheese; but the mode of making it having been soon discovered, it is now generally made throughout all the neighbouring counties; the sale is no longer confined to Stilton, and much of what comes to market under that denomination is of very inferior quality. Its richness depends, of course, both on the breed of cows employed, and the quality of the pasture on which they are fed, as well as upon the quantity of *cream* used in the making up; for, unless a large portion of this be added to the milk, the cheese will be deficient in all the essential qualities for which it is remarkable.

It is commonly made by putting the night's cream to the milk of the following morning with the rennet; and as soon as the

* Communication in the Agricultural Survey of the County of Somerset. 3d Edit. p. 247.

† Marshall's Midland Counties. 2d Edit. Vol. I. p. 320.

curd is come, it is taken out *whole* and put into a sieve, gradually to drain. While it is thus draining, it is pressed till it become dry and firm, and is then removed into a wooden box or hoop, adapted to its size; this sort of cheese being so very rich, that it would separate or fall to pieces were not this precaution adopted. Afterwards it is turned every day on dry boards, cloth binders being tied round it, and which are made tighter as occasion may require. After it is removed from the box or hoop, the cheese is closely bound with cloths, which are changed daily, till it become sufficiently compact to support itself; when these cloths are taken away, each cheese is rubbed over every day once (and if the weather be moist or damp, twice,) for two or three months, with a brush, which is also done every day to the tops and bottoms of the cheeses before the cloths are removed. Sometimes it is made in a net like a cabbage-net, which gives it the form of an acorn. Stilton cheeses are not sufficiently mellowed for use, until they are two years old; and will not sell unless they are decayed, blue, and moist. In order to accelerate their maturity, it is no uncommon trick to place them in buckets, and cover these over with horse-dung. Wine is also said to be added to the curd, in order to produce a rapid advance of ripeness.

In making *Wiltshire cheese* (which is admitted to be among the best English sorts) the milk is "run" as it is brought from the cow; or if it be of too warm a temperature, it is lowered by the addition of a little skimmed milk. The curd is, in the first place, broken with the hand to various degrees of fineness, according to the sort of cheese intended to be made. Thus, for *thin* cheese, it is not reduced so fine as in the county of Gloucester; for the *thick* kind, it is broken still finer; and for *loaves* it is almost crushed to atoms. But, in first breaking the curd, care is taken to let the whey run off gradually, lest it should carry away with it the "fat" of the cowl. As the whey rises it is poured off, and the curd pressed down; after this it is pared, or cut down, three or four times, in slices, about one inch thick, that all the whey may be extracted, and is then scalded in the same manner as Gloucester cheese. In some dairies it is the practice, after the whey is separated, to re-break the curd, and salt it in the "cowl"; but in others, it is taken, while warm, out of the liquor, and salted in the vat. The thin sorts are disposed, with a small handfull of salt, in one layer;

thick cheeses, with two handsfull of salt, in two layers; and loaves, with the same quantity, in three or four layers; the salt being spread, and uniformly rubbed among the curd. In general, Wiltshire cheese is twice salted in the press beneath which it continues, according to its thickness; the thin sorts three or four "meals," thicker ones four or five, and *loaves* five or six.

Green cheese is made by steeping over night, in a proper quantity of milk, two parts of sage with one of marigold leaves and a little parsley, after being bruised, and then mixing the curd thus *greened*, as it is termed, with the curd of the white milk. These may be mixed irregularly or fancifully, according to the pleasure of the maker. The management is in other respects the same as for common cheese. Green cheeses are chiefly made in Wiltshire.

Skim cheese is chiefly made in the county of Suffolk, whence it is sometimes called Suffolk cheese. The curd is broken in the whey, which is poured off as soon as the former has subsided; the remaining whey, together with the curd, being thrown into a coarse strainer, and exposed for cooling, is then pressed as closely as possible. It is then put into a vat, and pressed for a few minutes, to extract the remaining whey. The curd being thus drained from the whey, is taken out, again broken as finely as possible, salted, and submitted to the press. The other operations do not materially vary from those adopted in other cheese-making districts. The Suffolk cheese forms, in general, part of every ship's stores, because it resists the effects of warm climates better than others; but it is remarkable for "a horny hardness, and indigestible quality." A better kind is made in Dorsetshire, although the only perceptible difference in management consists in its being put together cooler; for, by putting milk together hot, and immediately applying the rennet, the whey drains so quickly as to impoverish the cheese, and render it tough.

Cream cheese is generally made in August or September, the milk being at that time richer and fatter than at other periods of the year. Not having the warm season to ripen it, this kind of cheese is generally made somewhat thick, in order to preserve its mellowness. Cream cheeses are more liable than the leaner sorts to accidents, owing to chillness, or the being frozen before they become hard: for when frost once penetrates a

cheese, it destroys every good quality, and generates putrefaction, or makes it become either insipid or ill tasted. Hence this kind of cheese should always be kept in a warm situation, and be particularly guarded against frost, and till it has sweated well; otherwise all the advantage of its rich quality will be completely lost*. Cream cheese is, however, in general only wanted for immediate use; and that kind commonly so called is, in fact, little else than thick sweet cream dried, and put into a small cheese-vat, about an inch and a half in depth, having holes in the bottom, to allow any whey that may exude, to pass, and having rushes, or the long grass of Indian corn, so disposed around the cheese as to admit of its being turned without being handled. It is thus, that the celebrated *Bath* and *York* cream cheeses are made, when genuine; but the greater part of those commonly sold are in part composed of milk.

New cheese, as it is usually termed in London, or, provincially, *slip-coat*, is made of new milk, and about one-third of warm water. When the whey is removed, the curd is carefully kept entire, and spread upon a cloth, to the thickness of less than an inch. It is then very gently pressed, for a few hours only, and when removed from the vat, it is covered with a cloth, and placed in a warm situation, as it requires to be brought forward immediately; and the management is therefore different from that of other cheese.

These are the kinds of British cheese in most general esteem; the other sorts, together with foreign cheeses, being too numerous to admit of detail: we shall, therefore, conclude with observing, that cheese should be kept in an airy place, and that if the moderately dried leaves of the tutsan, or park leaves, as it is provincially termed (*hypericum androsæmum*, L.); or, of the yellow star of Bethlehem, (*ornithogalum luteum*, L.); or, if the young twigs of the common birch-tree be placed on the surface or sides of cheeses, they will, especially the tender branches of the birch, be found very serviceable in preventing the depredations of mites. Sometimes, however, it happens that cheese will *hove* or swell, either from some accident, or from inattention in some part of the process. To prevent, as likewise to stop, this hoving, it has been recommended to lay such cheeses in a moderately cool, dry place, and regularly to turn them. When-

* Twamley on Dairying, p. 64.

ever any one becomes considerably swollen, it will be requisite to prick it on both sides in several places, particularly where it is most elevated, by thrusting a large awl, or pin, pretty deeply into it; repeating this as often as may be necessary. Though the pricking, it is observed, will not altogether prevent the swelling, yet it will, by giving a passage to the confined air, render it less considerable; and the cavities of the cheese will neither be so disagreeable, nor consequently so unsightly or unpleasant to the eye.

A very experienced dairyman * is of opinion, that from nine to twelve months' time are requisite to ripen cheese of any kind, if from fourteen to twenty pounds weight; and lays it down as a rule, in the process of making cheese, that the hotter it is put together, the sounder it will be; and the cooler, the richer, and more apt to decay. He also recommends the use of a small quantity of *loppered*, or sour milk, as a preventive of its rising, which is one of the worst accidents to which it is liable. To which we will add, as general maxims, that cleanliness, sweet rennet, and attention to breaking the curd, are the chief requisites in cheese-making.

CHAPTER VI.

ON THE PRODUCE OF A DAIRY.

THE produce of a dairy is to be regarded in a two-fold view, as it respects *quantity* and *value*. Both depend in a great degree upon management; for if the cow be injudiciously treated, or the butter and cheese be badly made, both the product and the price will be materially diminished. There is no part of farming more steadily profitable than the dairy; but, at the same time, none demands greater judgement and attention.

Of the three objects of the dairy,—selling the milk, or, as it is commonly called, *cow-keeping*, *making butter and cheese*, and *suckling*,—the first is generally the most profitable, at the usual price obtained for the milk: but it can only be carried on in

* Mr. Parkinson, Treatise on Live Stock, Vol. I. Ch. I. Sect. 12.

the immediate vicinity of large towns, and even there, the expense of providing fodder, and the fluctuations of its price, while that of milk seldom changes, together with the injury to the health and consequent value of the cows, from the close confinement to which they are usually subjected, often render it a hazardous, and always an unpleasant business.

The making of butter and cheese, which may be distinctively termed *the dairy*, ranks next in the scale of profit. A well fed cow, of a good breed, will produce, on an average, 180 lbs. of butter in the season; and this, where there is an immediate market for it while fresh, together with the value of the skim-milk, will pay better than cheese. The common calculation is, indeed, 150 lbs *; but this is made upon mixed stock, which afford no certain data. In the Epping district, where no particular attention is paid to the selection of stock, and where there is an indiscriminate mixture of Devon, Suffolk, Leicester, Holderness, and Scotch, the calculation, in a well managed dairy, amounts to ..... 212lbs.

viz.

6lbs per week, during twenty-six weeks.....	156
4lbs per week, during fourteen ditto	56 †

in forty weeks, which is full four weeks sooner than they need be generally allowed to go dry, and there is no doubt that, with proper care in the choice of the cows, and proper pasture to support them, that calculation would be supported in good years; it might not in parching seasons, but then all dairy produce must suffer equally.

The average product of cheese, in the best dairies, where the whole milk and cream are used, cannot be estimated at more than 4 cwt. In Leicestershire, indeed, and on other deep grazing soils, that carry heavy stock, a well managed cow is reckoned to

* In the Sussex Agricultural Survey there is an account of the produce of the Duke of Richmond's dairy; from which it appears that the cows, all Suffolk, produced an average of only 156lbs. in the season; but it does not mention how they were fed; probably they were pastured in the park.

The same survey mentions a Sussex cow, that for some weeks after calving gave ten pounds of butter, and twelve pounds of cheese per week. pp. 254, and 257.

† Essex Agricultural Survey, Vol. II. p. 289.

make from three to five hundred, long weight of 120 lbs*, besides supporting her calf until it can be weaned; but such cows require full three acres of the best meadow, for summer and winter keep, and it is not in the power of every farmer, if he even have the stock, to procure such land to maintain them. In Somersetshire, the average is four cwt. and a half†; in Essex, not so high‡; and Mr. Marshall states that of all the midland counties at something more than three cwt§.

Suckling is generally considered the least profitable; but it is also the least troublesome; and probably that and the making of butter combined, are the most advantageous; as thus: supposing a steady weekly demand for butter throughout the year, then the most advisable plan might be, to keep such a number of cows as would supply that demand during the winter; and in summer, when butter is cheap and veal in demand, to apply the extra milk, beyond the quantity required for the usual consumption of butter, to suckling calves, either for the market, or for stock, as may best suit the ulterior views of the farmer. This must, however, depend on the situation of the farm; for that may not always afford an opportunity for the acquisition of a succession of calves for suckling, or a market for them when fat; or it may not be adapted for the rearing of stock; and in such cases, the best application of the skim milk is either to feed pigs, or to make skim-milk cheese. The usual time required for fatting calves for the butcher has been already stated to be ten to twelve weeks||; perhaps less in summer, when the milk is abundant and rich; and more when it decreases in quantity and quality. But as the calf does not require the entire milk of the cow which has calved it, for some weeks after its birth, the cow will for a short period support two; and two cows, calving at different periods, may be calculated to fat seven calves between them in the year.

In *feeding pigs*, it has been found that four cows will, in the season, fat a pig of forty pounds weight, to twelve score, which is

* Leicester Agricultural Survey, pp. 154 and 227.
† Somerset Agricultural Survey, 3d Edit. p. 251.
‡ Essex Agricultural Survey, Vol. II. p. 271.
§ Rural Economy of the Midland Counties, 2d Edit. Vol. I. p. 326.
|| See Book I. Chap. VI.

fifty pounds each cow, besides keeping the calves until weaned: and pigs, it may be remarked, have been fattened to great weights upon milk alone.

Some dairymen allow two hogs to five cows, also rearing the calves; but experience proves, that two cows will support a two year old hog until he is put up to fatten. In the neighbourhood of a good market, it will, however, be most profitable to fatten porkers.

Of *skim-milk cheese*, the quantity may be calculated at two cwt. from each cow; but in comparing the two modes of employing the milk, there must be deducted from the product of this application of it the value of the dung that would have been made by the pigs.

Throughout the system of dairy management, the vigilant eye of the principal ought carefully to pervade; as it rarely happens that servants are to be found who will give that minute attention to every particular, which is so indispensably necessary to ensure success. On this account, it is more likely that a dairy farm of moderate size,—one for instance that will keep ten to twenty cows,—will, *if well managed*, afford a larger proportionate profit than one of a greater extent; because, in the former case, the farmer's wife and daughters can more easily superintend, or perhaps perform a considerable part of the dairy operations themselves; and this is always better done by them than we can ever expect it to be by hired servants. No branch of husbandry, in fact, deserves and requires such unremitting attentions.—"If", Sir John Sinclair very justly remarks, "a few spoonfuls of milk are left in the udder of the cow at milking; if any *one* of the implements used in the dairy be allowed to be tainted by neglect; or if the dairy-house be kept dirty, or out of order; if the milk is either too hot or too cold at coagulating; if too much or too little rennet is put into the milk; if the whey is not speedily taken off; if too much or too little salt is applied; if the butter is too slowly or too hastily churned; or if other minute attentions are neglected, the milk will be in a great measure lost. If these *nice operations* occurred only once a month, or once a week, they might be easily guarded against; but, as they *require to be observed during every stage of the process, and almost every hour of the day*, the MOST VIGILANT ATTENTION must be kept up throughout the whole season. That is not to be ex-

pected from hired servants. The wives and daughters of farmers, therefore, having a greater interest in the concern, are more likely to bestow that constant, anxious, and unremitting attention to the dairy, without which it cannot be rendered productive."*

* Sir J. Sinclair on the Husbandry of Scotland, Vol. II. p. 124.

BOOK THE THIRD.

ON THE BREEDING, REARING, AND MANAGEMENT OF FARM-HORSES.

CHAPTER I.

INTRODUCTORY AND COMPARATIVE VIEW OF THE DIFFERENT BREEDS OF FARM-HORSES.

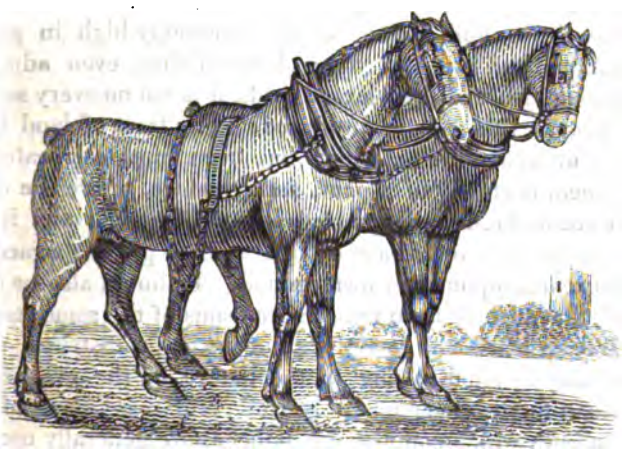
In a wild state the horse is, in general, of an inelegant form, and extremely intractable; but, when domesticated, he becomes docile, yet bold and intrepid, and is highly attached to man. In no country have his various qualities, both for the turf, the field, and the road, been brought to such perfection as in England; and, with the exception of the pure Arabian, there can nowhere be found a breed to compare with the English race-horse. The subject of thorough-bred horses is, however, beyond the scope of this treatise, which, being intended for the use of farmers, we must confine to a description of the species of draught cattle best suited to their purposes; and these may be ranked under the several denominations of Cleveland Bays, Suffolk Punches, and the Old English Black, or Lincoln cart-horse.

I. The CLEVELAND BAYS, delineated above, are bred in various parts of Durham, Northumberland, and Yorkshire. The latter county has, indeed, been long famed for its superiority in breeding horses of every description, and more especially the North Riding; the prevailing species, however, are those adapted for the saddle; but in the district of Cleveland, whence, as well as from their common colour, the breed immediately under consideration derives its name, they possess more bone than the others, and, being altogether more powerful, are better adapted for draught. They are, accordingly, much used in the North for agricultural purposes; and are there considered quicker in the step, more handy, and in all respects more useful than the heavier cart-horse of the South; while they are also said to consume less food.

They carry a fine coat, with black mane and tail, and although rather coarse-headed, yet having a fine fore-hand, with a well set shoulder and neck, a deep chest, and round barrel, and measuring from sixteen to seventeen hands in height; they have a grand appearance, and were, therefore, in much demand as coach-horses, while the heavy family carriages of former days were in vogue. Good hunters for heavy weights were also formerly bred from the mares, when covered by thorough-bred stallions; but since fox-hounds have been trained to run with their present speed, and since the baroûche has been substituted for the coach, these have been condemned to the collar, and hunters are now only to be obtained from the second, or even the third, cross.

The Cleveland Bay is, indeed, better calculated for slow draught, than for any other purpose. His carcass is rather too heavy for his limbs; which are, besides, deficient in the elasticity requisite to quick action, from being round-boned, and weak below the knee, which is apt to overhang the lower joint; and he, therefore, soon tires when urged beyond his common pace. When not pressed, he will support a very long continuance of fatigue; being, it is said, often known to travel the extraordinary distance of sixty to seventy miles within the twenty-four hours, with heavy loads, three and even four times a week, besides being employed occasionally on the intermediate days *. There is, indeed, no better animal for farm labour; and the mares are the best species of stock for the double object of work and breeding.

There is a mixed breed, in other parts of Yorkshire, obtained by crosses with black and blood horses; but, for the general purposes of farming, they are not equal to the original stock. Many of the *Clydesdale* race are also bred: they are strong, active, hardy animals, of the middle size, remarkably steady, true pullers, and well adapted to all the purposes of husbandry.



II. The SUFFOLK PUNCH is distinctively a farm-horse, for the breed has been preserved more pure than most others, and

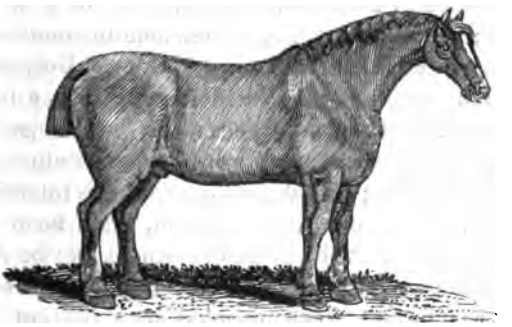
* See the Agricultural Survey of Durham, p. 257.

being neither handsome enough for a gentleman's carriage, nor heavy enough for a London cart, or a waggon, he is seldom employed for any other than agricultural labour. His colour is almost invariably bright chestnut; the head coarse, with ears standing wide apart, and the fore-hand low, with a heavy shoulder, and no great depth in the chest; but, to counterbalance these defects in shape, the back is straight and broad across the loins, the hind quarters and thighs are large and strong, the fore-arm sinewy, and the lower joint and pastern short; the body is, perhaps, rather too full in the flank, and flat in the sides, but the shoulder, though thick and standing forward in an unsightly manner, is yet well placed for the collar, and is thus, in fact, one of his best points. His size rarely exceeds, and is generally under fifteen hands and a half; but his compactness and activity render him particularly serviceable where very heavy draught is not required.

It is said that the Suffolk Punches are superior, from the quickness of their step, and their handiness in whip-reins, to all other horses at plough; but this is denied by all Yorkshiremen, who maintain the superiority of the Cleveland; and the Leicester and Lincolnshire breeders insist, that the old English black cart-horse is to be preferred to either. However this may be, the Suffolk breed stands deservedly high in general estimation; and it is also to be observed that, even admitting the pre-eminence of their larger rivals, it is not on every soil that such heavy cattle can be produced. The tract of land in the vicinity of Woodbridge, which has been most celebrated for this breed, is chiefly of a poor, sandy nature, where the others could not be bred with equal advantage, if at all; and it is of great importance to farmers of light soils to possess a race that can be reared upon their own ground. It should also be recollected, that such soils do not require teams of the same strength as the deep loams and heavy clays of the richer districts; and it is probably as much owing to the nature of the ground, and the broad furrow common to Norfolk, and many parts of Suffolk, in both which counties the punches are generally used, as to any intrinsic superiority in the breed, that they have acquired their reputation for ploughing more land within a given time than any other kind of farm-cattle.

The figures above given are portraits of a pair of capital punches, which formerly belonged to that eminent farmer Mr.

Wakefield, of Burnham, in Essex, who was eminently successful in breeding this stock, and at one time was in possession of a stallion of the breed, Briton, for which he refused 400 guineas.



III. The BLACK CART-HORSE, of which the above is a figure, is bred in the counties of Leicester, Northampton, and Lincoln, and some of the neighbouring shires; but the largest kind, principally used in brewers' drays, and other heavy road-work, is chiefly reared in the fens of Lincolnshire. These counties have been from time immemorial in possession of a celebrated breed of black horses; indeed, such was the pride some men took in their teams, that there is in existence the record of an old agreement, by which the farmers in the parish of Wimeswold, in Leicestershire, bound themselves not to use mares; and some, with a laudable disdain of the gelding, only employed stallions *.

An improvement upon that original stock is said to have been effected by the late Earl of Chesterfield, who, during his embassy at the Hague, sent over six Zealand mares to Bretby, his lordship's seat in Derbyshire, whence their stock found its way into Leicestershire, where it was further improved by an importation of West Friezland mares, made by Mr. Bakewell. From a cross between these and a native stallion, that gentleman produced some very fine cattle; one of which, a celebrated horse, named G. (afterwards killed by lightning,) he had the honour of showing personally to his late Majesty; and another

* Agricultural Survey of Leicestershire, p. 283.

called K. was an equal object of admiration. By this mixture of blood, Mr. Bakewell got rid of much of the length and looseness of form, and the long, thick, hairy legs, attributed to the original breed, and obtained a more compact and short limbed animal, possessed of more activity, and, as he alleged, of a better constitution; being more hardy, better able to stand hard work, and to carry more flesh upon less provender. But, in attaining these essential objects, it may be doubted whether he did not sacrifice too much of real substance: one great object of all his improvements in cattle seems to have been, to reduce the bone and increase the flesh; and although, in animals intended for the shambles, that may, to a certain extent, have been judicious, yet, in those appropriated solely to labour, it may be a question, whether the reduction of bone beyond that excess which may be deemed coarse, is not accompanied by a proportionate loss of sinew, and, consequently, of strength. This defect, however, if it was to be so considered, has been rectified; and in that respect there is, at present, no deficiency in the breed: it may, indeed be observed, by an inspection of the Flanders horses, now constantly imported, that our present stock is far superior to that by which it is said to have been improved.

Although black, with a blaze on the face, and some white occasionally on the legs, are still the prevailing marks of this race, yet they are no longer so distinctively; for, in consequence of various crosses, they are now to be found of all colours. They are generally small headed (for their size), short-necked, with thick shoulders, standing upright to the collar; short in the back; deep and round in the body, with very broad backs and loins; the quarters thick, the thighs and fore-arms very strong, and the legs short, with large round hooves. They possess great strength; and though very slow, and apparently sluggish in their action, they are not deficient in bottom; and from their weight, as well as their natural power, they go through draught-work that could be performed by no other animal. That particular species, commonly known as the *Dray-horse*, is, more especially, a model of symmetry and strength combined; and not the least of his perfections is his extreme docility, which cannot but be an object of remark to any one who witnesses his performance in the crowded streets of London.

CHAPTER II.

ON BREEDING HORSES.

THE *breeding of horses*, as a distinct concern, can only be carried on, with any prospect of success, in those districts where a farm comprises an extensive tract of coarse pasturage, which cannot be advantageously appropriated to the fattening or grazing of cattle. Of this description are part of the North Riding of Yorkshire, the fens in the county of Lincoln, and the pastures of Leicestershire and some of the midland counties. In such case, the same attention must be paid to symmetry of form, purity of breed, and individual excellence, as in breeding cattle in general. But the entire attention should not, as is too commonly practised, be confined to the stallion. So far as experience has hitherto shewn, it has in most instances been found, that nearly as much depends upon the mare as upon the horse in regard to the form and other good qualities of the progeny. No idea can be more erroneous than the too common one of breeding a good hunter from a blood-stallion and a cart-mare; nor can anything be more ridiculous than to suppose that the qualities of each will be so equally blended in their offspring as to constitute a happy medium between both, thus producing a colt in which the speed and liveliness of the sire shall be combined with the strength and consistency of the dam; whilst every judicious observer must have remarked that there is very frequently a perceptible degeneracy even from the worst of the two; the mongrel breed rarely possessing in any considerable degree the power or size of the one, or the spirit, activity, and fine bone of the other. Instead of attempting such violent crosses, it is generally more advisable, when the mare has any good points, to select a stallion as similar as possible in form, as thus there will be a probability that the foal will possess them in still greater perfection. But notwithstanding the general truth of these axioms, as persons are often induced by various motives to breed from very inferior mares, it is in such cases deemed prudent to choose a stallion as free as possible from her defects; or, in other words, possessing those properties in which the mares are peculiarly deficient. It is this inattention to the

peculiar qualities of sire and dam, and the disregard to the necessary requisites of country and keep, that annually causes the production of such an infinity of horses, that, from certain deficiencies in shape, strength, action, and constitution, bear no proportional value to the expense and trouble they occasion, ere they are fit for use; and, being peculiarly adapted to no one particular purpose, become a useless burthen to their owners; who, not unfrequently, fixing an ideal value upon what they have been at so much pains to rear, suffer them year after year to consume food which might be much more advantageously applied, without adequately repaying, by their labour, the expense of their keep. These strictures, however, are not applicable to the breeders of the black draught horses of Lincoln, Leicester, Northampton, and some few other counties, adapted by nature to the purpose, where it must be admitted that the breed is cultivated with the strictest attention to corresponding points and perfections in both sire and dam. Stallions of eminence in the above counties are estimated at very considerable sums, and frequently let out to cover, at the Easter stallion show, at Ashby, in Leicestershire, from one hundred to two hundred guineas the season. The stock generally comes into gentle use at two years old, and, when brought to a good size in proper time, frequently fetch from thirty to eighty guineas at two or three years old.

Those horses passing under the denomination of hunters, but more particularly the common crosses for roadsters and hacks, can by no means prove so generally profitable, when all contingencies are taken into consideration: the length of time they are obliged to be kept on hand and maintained, (till at least four years old,) with the unfavourable changes they may probably undergo before they can be brought to the ultimate market most applicable to their different qualifications, render the whole a matter of much greater uncertainty than with horses of the preceding description; for the unavoidable difficulties of cutting, breaking, backing, docking and nicking, render them serious operations, the success of which cannot be ascertained without encountering a chance of misfortune or failure. Independently of these general considerations, it must be borne in mind, that counties differ so very much in those circumstances which render breeding profitable*, that many will not produce

* Sir John Sebright's Essay on the Improvement of the Breeds of Do-

horses of size, and the other desirable qualifications, at even treble their real value; for it is a certain and indisputable fact, that no part of the kingdom that is not remarkable for the abundance and luxuriance of its herbage, can ever produce stock of size and value to render breeding profitable: the attempt, therefore, in unfavourable situations, must ever recoil upon the adventurer with disappointment.

A brood mare having been obtained, corresponding in size, frame, bone, and strength with the wish of the breeder, and found, upon accurate examination, to be perfectly free from natural blemishes and defects, the choice of a stallion becomes an object of attention. In him should centre all the points and qualities that it is possible for a good horse to possess; for, notwithstanding the acknowledged influence of the mare, the produce, whether male or female, much more frequently acquires and retains the shape, make, marks, and constitution of the sire than the dam. This justifies us in rejecting stallions with the least appearance of disease, blemish, or bodily defect; at least, if there be the slightest probability of its being transmitted to the offspring. It is even necessary to descend to the minutiæ of symmetry in the head, neck, shoulder, forehand, ribs, back, loins, joints and pasterns, attending to a strict uniformity in the shape, make, and texture of the very hooves: and, if possible, to ascertain the temper and disposition. It is also proper to examine the state of the wind, and to endeavour to discover whether there is any tendency to spavins, curbs, cracks, or grease, bad conformation of the feet, as corns, thrush, or long and narrow-heeled hoofs; either of which would furnish sufficient reasons against him as a sire, however recommendable he might be in other respects.

Blind stallions may, indeed, sometimes get colts with good eyes, yet breeding from such had much better be avoided, as a hazardous experiment. In order to justify this opinion of the danger of breeding from horses of this description, a well-informed writer in the Pantalogia states, that, in the year 1773 or 1774, a great number of brood mares in his neighbourhood had been covered by a very popular blind stallion, belonging to the Honorable F. King, near Ripley, in Surrey, whose pedigree, shape, make, figure, and qualifications, were so much extolled,

mestic Animals, pp. 11 to 14; and Communications to the Board of Agriculture, Vol. II. p. 185.

that the want of eyes did not seem at all to constitute an objection. The event, however, was, that, about the third or fourth year the major part of the colts produced by this stallion became as blind as the sire.

Still anxious to ascertain the hereditary transmission of this defect, Mr. Taplin met with another proof of the fact in the spring of the year 1780, when a gray horse, called Jerry Sneak, which had proved a tolerable runner, in the possession of Lord Spencer Hamilton, came into his hands just as his eyes were failing. This horse covered a few mares in the neighbourhood of Frimley, near Bagshot, but it was found, in the fourth year, that many of the produce were totally blind, and the remainder were all likely to become so.

On the subject of crosses there are various opinions: it was that of the greatest breeder in this country, deduced from long and attentive experience, "that to cross with a breed not decidedly better than the breed to be crossed, ought never to be attempted." But, when a superior breed could be obtained, Mr. Bakewell thought it a desirable measure; and in these sentiments he was joined by the late Mr. Campbell, of Charlton, also a consummate judge, and who thus expresses himself in some letters on the subject addressed to Lord Egremont:—"As to the art and mystery of generation, or conception, all that I pretend to know—and that I do, by many experiments, to a certainty—is, that ill shapes and properties of particular breeds, when introduced in others, even by a single cross, will continue to have effect, sometimes more, sometimes less, and sometimes lurking for generations, scarce perceivable, or even totally out of sight, or feel, and then break out on some individual as strongly, and with as bad effect, as if there had never been any further mixture or addition of the blood on the other side. I therefore consider crosses to be a matter requiring the greatest caution, and what I should never choose to do, if there was one bad property in the proposed cross; and I am of opinion, that the surest and best means of improving a breed, is by constantly and completely weeding the original stock and nursery, and securing the opportunity of advantage from particular extra individuals which may happen to be produced in it; and in every respect availing one's self of all the use it may afford, and carefully preserving the continuance of it as long as possible, or until a yet better comes." The judicious breeder will,

however, observe, that this does not authorize the system of *breeding in-and-in*, so far as to weaken the original stock; which it undoubtedly will do, if long persevered in; but only requires that it should be confined to the most perfect animals of the same *breed*, though not of the same *stock*. The advocates of that practice maintain, "that best can only produce best; and therefore, that when you cannot procure a better animal than your own, you should breed from that." But repeated trials have proved, that animals of all kinds so produced, that is to say, bred from a continuation of the same race, degenerate in size and vigour; and, besides, perpetuate those defects, some of which are found in every breed: therefore, after a couple of descents from the same family, if not after the first, it is always advisable to cross the mares with a stallion from another stock.

CHAPTER III.

OF CART STALLIONS AND MARES.

Our observations upon breeding have already touched so largely upon the requisite qualifications of all horses intended to propagate their species, that it only remains to particularize those which are peculiar to the heavy draught cattle which claim our immediate attention.

The *cart stallion* should possess all the properties of vigour and constitution, the strength of muscle, and the just proportion of bone to size, which all breeds ought to share in common. But there are certain points considered essential to the symmetry of saddle horses, which may be deemed imperfections in those which are destined to the collar. Thus, one of the most important points in a hunter, and more especially in a good hack, is, that he be high in the fore-hand, with a shoulder thrown back, so that the saddle may rest far behind his fore-legs, and that thus the weight of the rider may not impede his action; but in draught horses, the shoulder can hardly stand too upright, so that the collar may bear equally upon it throughout,

without pressing too much upon the point, and a low fore-hand is found advantageous, inasmuch as it brings the traces more upon a level with the line of draught. Thus also, the small head, the expanded nostril, and the fiery eye, so much admired in blood horses, are indications of spirit and impatience, very ill suited to an animal that is required to obey the voice of his driver, and whose steadiness is one of his greatest merits. The cart-stallion should, therefore, have a moderately large head, with a full, but placid eye, a muscular neck, with a broad, deep chest, and a full upright shoulder; his back should be broad, and rather short and somewhat curved upwards over the loins, that being a sure sign of strength; his barrel should be round and deep, and well ribbed up to the huckle bones, which should not stand prominently out; his quarters and thighs should be thick, the arms sinewy and strong, the legs short, and the hooves round, but wide at the heels, of a dark appearance and tough substance. His colour must depend upon the breed, and it has often been remarked, "that there are good horses of all colours," yet the darkest are generally found to be the hardiest; blacks are proverbially steady pullers; and experience has proved, that grays are particularly subject to become blind. His size ought to be a material consideration; for, even in the heaviest breeds, very large bone is not always an indication of proportionate strength, and over-limbed cattle are apt to tire sooner than those of a lighter make: compactness of shape is better adapted to hard work and bottom; and it should be remembered, that the greatest improvements in our stock of blood horses have been effected by the smaller breeds of Barbary and Arabia.

The only material distinction between the form of a brood mare and a stallion is, that she ought to be rather longer in the body; and of the two, it has been considered by an eminent anatomist* better that the mare should be the largest, or at least larger than the usual proportion between them. The *cart-mare*, therefore, when intended to supply the team with draught colts, ought to have a large body in proportion to her height, and to be full in the flank, as an earnest of her having plenty of milk, and becoming a good nurse. Her constitution

* The late Mr. Cline. See communications to the Board of Agriculture, Vol. IV. p. 440—446.

should be healthy and vigorous, her temper gentle and tractable, and she should, also, be free from all hereditary defects; for on the good qualities and strength of constitution, united in the sire and dam, will in a great measure depend the future health, strength, and usefulness of the colt.

The *period of gestation* in mares is about eleven calendar months *, and the time of putting them to the horse varies from April to May. The former month is preferred by many persons, from an idea that the earlier the foals are dropped in the ensuing spring, the better chance they will have of thriving, in consequence of being suckled longer, before it becomes necessary to wean them, than if they had been dropped later. But the season at which they are then born, is generally so bleak as to chill them, to the great prejudice of their growth, nor is the herbage either sufficiently abundant, or rich, to afford the necessary supply of milk; it is therefore an injudicious practice, unless the mares are well supplied with succulent food, besides their pasture, and that they have also the advantage of warm sheds to run under at pleasure; and it is even still less advisable for mares that are employed in farm labour, for if they are covered early, they will drop their foals at the busiest season of the year. For them, therefore, the month of May is preferable; for thus they will foal after the spring sowing, at a period when there will be grass and, soon after, winter tares for their support, with abundant time for them to rest before their services will be again wanted for turnip sowing and hay harvest. For mares which have already dropped their foals, the best time is about nine days after, when they will generally be found in season; if not then stinted, it is usual to put them to the horse in nine days after that time, but it is by many experienced breeders considered better to defer it for nine days more.

Those Yorkshire farmers, who breed from their working mares, generally employ them in their business until the very time

* The result of the experiments made by M. Teissier on the gestation of mares is as follows:—

Of 278 mares, 25 foaled between the 322d and 330th day: mean term 326

227	.....	330th	359th	.... 344½
28	.....	361st	419th	 390

There was, therefore, between the longest and the shortest period an interval of ninety-seven days.

of foaling, after which, they have usually two or three weeks' rest before they are again put to labour. The foal, during the time its dam is working, especially when it is young, is shut up in a stable; and it is the practice of some to bathe her udder with cold water, when she returns from work, and to draw some of the milk from it, lest, in consequence of its being heated, it should have a bad effect upon the foal. Some continue this practice as long as the foal sucks; others, after it has acquired sufficient strength to run with the mare, allow it to accompany her at her labour on the farm, from an opinion that it is of advantage to both that the milk should be frequently drawn *.

At Dishley, and some other well managed farms in Leicestershire, and throughout the fens in Lincolnshire, the whole work is done by mares and oxen. Of the mares, all that are fit are put to the horse, of which three are reckoned upon an average to rear two foals, allowing one in three for casualties †.

Mares should be put partly to hard meat a few days before the weaning of the foal, and entirely so immediately after their separation, as it assists in drying off their milk; and, if again in foal, it is of service in strengthening them, and in preventing them from slinking, an accident which is not uncommon at that period. Care, however, should be taken to keep their bodies open; for which purpose either bran mashes should be given nightly, until they are in a proper state, or they should be allowed to sleep in a paddock: the latter is the better practice, for the less mares in foal are kept in the stable, the better, and open sheds are at all times preferable.

Moderate work, so far from being prejudicial while they are in foal, is of service in enabling them to bring forth with greater ease, and may be continued with safety to the very eve of their foaling, which may be known, first, by the springing of the udder, and more immediately by the teats becoming filled with milk.

* Agricultural Survey of Yorkshire, p. 275.

† Agricultural Survey of Leicestershire, p. 287. Agricultural Survey of Lincolnshire, 2d edit. p. 423.

CHAPTER IV.

ON THE REARING AND TRAINING OF COLTS.

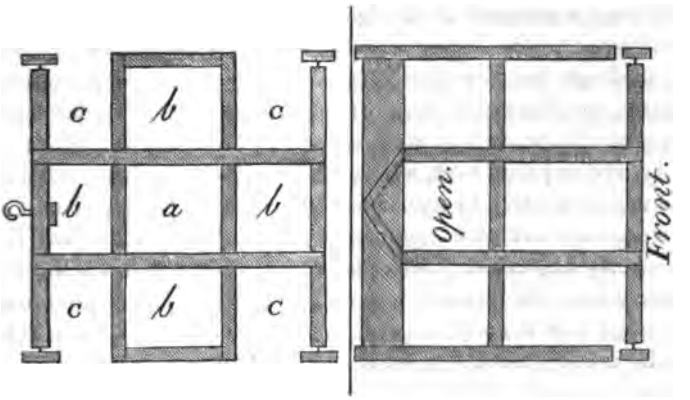
DURING the first summer, the foals may be allowed to run with their dams until Michaelmas, or even longer, if the weather continue open and mild. They should then be weaned and kept in fold-yards, or paddocks, containing open sheds, with low racks and mangers for receiving their food; which ought, at first, to be the sweetest hay that can be procured. Where rowen, or after-math, can be commanded, it will furnish a succulent and invigorating article; but, both with hay and rowen, bran, oats, or pollard, or a moderate quantity of bean-meal should be given in due proportions, which indeed can only be ascertained by experience. When, however, oats form a part of the food, it has been recommended to bruise or crush them previously in a mill; which necessary precaution will prevent the distention of the lower jaw veins, which would otherwise attract the blood and humours down into the eyes, and thus occasion blindness. Further; by feeding young colts with oats, in conjunction with other articles, their limbs become better knit than when they are fed only with bran and hay; while they will also be enabled to endure greater severity of weather, and to acquire the vigour requisite to their future improvement. It may, indeed, be assumed as an axiom, that there is no greater error in breeding any animals, than that too common one of stinting them during the early period of their growth. It is then that they require the greatest nourishment; and if it be withheld, they will be injured in their constitution, and consequently in their value, to a far greater extent than any saving that can be effected in their food: but to no animal does this remark apply more strongly than to the horse.

It is a common practice, on *weaning foals*, to put them into warm stables during the following winter; from a notion that they are not, at that early age, able to support the cold of an open shed. Whether this may be judicious with regard to the

more tender breeds of blood cattle, it is not our present object to inquire; but with respect to the cart species, it is unquestionably wrong. These, from the nature of their future employment, must necessarily be exposed to every vicissitude of weather; and they cannot be too early inured to a certain degree of hardship. They should, indeed, be carefully kept from lying out, in the wet, at night; but during the day they cannot be too much abroad; and dry hovels are far to be preferred to warm stables for their nightly shelter. It has been even found that young colts, which had shown symptoms of disease while kept with all the care usually bestowed on hunters, have recovered when removed to a paddock, and that weaned foals have thriven better when only sheltered in a rick-yard than when housed*.

Colts, thus treated, will have acquired sufficient strength and hardihood, before the second winter, to be enabled to brave the inclemency of the season, without any other food than hay, or any other covering than that with which nature has provided them. The largest dray-horses are thus reared in the Lincolnshire marshes: yet, if they can be allowed the shelter of a straw-yard, with the addition, to their hay, of unthrashed oat-straw, or some of the succulent roots, but especially carrots, it will be of material benefit; but they should be daily turned out into a field, as exercise is not merely conducive to their general health and growth, but particularly requisite in strengthening the sinews of their limbs, and giving firmness to their feet. This, indeed, is attended with additional trouble; for, in severe seasons, or when the pasture is quite bare, it becomes necessary to feed them in the paddock to which they are turned. This is commonly done either by throwing the food on the ground, or giving it in cribs; by which means it is exposed to be either trampled, or spoiled by the wet, and the strongest colts often prevent the others from eating. To remedy these inconveniences, there is a very simple machine in use at Dishley, which is well worth imitation on farms where many colts are bred: it consists of a *Colt's Trough*, formed thus—

* See Parkinson on Live Stock, Vol. II. pp. 65. 67.



The centre (*a*) consists of a cratch, or bin, for the reception of the provender, with four mangers (*b*) projecting from it; the open spaces (*c*) being so many stalls for the colts, four of which can thus eat at the two interior, and others at the two outer mangers. Thus the master colt cannot readily drive away another without losing his own feed; and being obliged to stand separately, they cannot easily kick or bite each other; while, the whole being roofed in, the food can be neither spoiled nor wasted; and being on wheels, the machine can be moved as occasion may require*.

The following summer the colts should be allowed the range of the best pastures, though they are too frequently turned on the worst†; and in autumn they should be taken in, for the purpose of being broke to labour.

The *process of training* horses for the saddle is one of considerable nicety: for those intended for the plough, it is much more simple; but for both, the chief and best means are, gentleness and patience. The horse is an animal of much observation; capable of great attachment, and of equally strong resentment: if treated with kindness he becomes docile; but severity generally fails of its object, and renders him intractable. There is certainly much difference in their natural temper, some requiring much more care and time to reduce them to obedience than others; but even the most restive may be rendered manageable by mild usage.

* See the Agricultural Survey of Leicestershire, p. 67.

† See the Agricultural Survey of Yorkshire, North Riding, p. 275.

From the moment of its being weaned, the foal should be accustomed to the halter, and to be wisped over and occasionally tied up; but this should be done by the same person who feeds it, and that care should never be entrusted to lads, who will probably teaze the animal and teach it tricks, or to any hasty, ill-tempered man, who would be likely to ill-treat it. The colt will thus early become accustomed to be handled, and will consequently occasion much less trouble, than if he had been previously neglected. After being a day or two in the stable, a bridle should be put on; but with a small bit at first, instead of the large one usually employed by horse-breakers, and which, by the horse's champing on it with impatience, sometimes occasions the mouth to become callous. He should then be led about, and accustomed to obey the rein in turning and stopping, which he will very soon learn; and, after a few days, he should be completely harnessed, and put into a team among steady cattle. Care should, however, be taken, neither to whip him nor to force him to draw, but leave him quietly to walk with the other horses, and in a very short time he will imitate them, and begin to pull. It may then be as well to let some one mount him, even if he should not be intended to be commonly ridden, as it will render him the more docile; but this had better be done while he is in the team, as the other horses will prevent him from plunging. Let no violence be used; for such is his power of observation, that while he will readily learn every thing that he is taught, he will also recollect many things that might be wished forgotten: thus, if flogged for starting at any particular object, he will only start the more on meeting it again, for he will remember the chastisement it occasioned; and if hurt in shoeing, or on any other occasion, he will never forget the pain it occasioned, and will never suffer a repetition of the same without impatience.

Castration is commonly performed when the colt is twelve or eighteen months old: some defer it longer, thinking that the later the operation is performed, the more strength and spirit he will have acquired; but it is attended with greater danger at that period; and it is much to be doubted whether it may not even be prejudicial to his temper. It is, besides, to be observed, that the severity of the operation occasions a check to his growth, which is more felt and of more consequence at an advanced period, than when he is quite young. It is also

worthy of consideration, in a pecuniary view, that the older the animal is, the greater will be the loss, in case he should die; and therefore, perhaps the most prudent time will be during the summer that the foal is sucking. Fears are sometimes entertained of performing the operation in hot weather, lest inflammation should take place; but extreme heat may be avoided, and there is even less danger from that than from cold, and the exercise of running with the mare will promote the suppuration, which will also be assisted by the warmth of her milk. At a more advanced age, the colt should be guarded from wet, and not allowed to drink cold water until the suppuration is complete. It is unnecessary to describe the operation, as that is always performed by a farrier.

CHAPTER V.

OF THE AGE, QUALIFICATIONS, AND SALE OF HORSES.

THE names by which horses and mares are distinguished while young, are,—horses, *colt foals* during the first year, and afterwards *yearling*, *two year old*, and *three year old colts*, until four years old, when they become *geldings*, if castrated, and, otherwise, *entire horses*, or *stallions*.

The mares are called *fillies*, while sucking; then *yearling*, *two*, and *three year old fillies*, until four, when they finally acquire the appellation of *mares*.

The *age* is calculated from the first of May: thus, previous to that month, a horse may be said to be *rising* four, five, or six years old; but when it is passed, he is said to be four, five, or six years old, *off*, until after seven years, when he is termed *aged*.

The following hints, relative to the age and the essential characteristics of a good horse, may not improperly form a part of the present outline.—In old horses, the eye-pits are generally deep; though this mark is very uncertain, as it also occurs in young horses that are descended from aged stallions. But the most certain criterion is that derived from the teeth, the number

of which amounts to forty; namely, twenty-four grinders, or double teeth, (which in fact afford no certain guide,) and sixteen others, viz. four tushes or tusks, and twelve fore-teeth: these last are the surest guides for discovering the age of a horse. As mares usually have no tusks, their teeth are only thirty-six. A colt is foaled without teeth; in a few days he puts out four, which are called pincers, or nippers; soon after appear the four separaters; next to the pincers, it is sometimes three or four months before the next, called corner teeth, push forth. These twelve colt's teeth, in the front of the mouth, continue, without alteration, till the colt is two years or two years and a half old, which makes it difficult, without great care, to avoid being imposed on during that interval, if the seller find it his interest to make the colt pass for either younger or older than he really is: the only rule you have then to judge by is his coat, and the hairs of his mane and tail. A colt of one year has a supple, rough coat, resembling that of a water-spaniel, and the hair of his mane and tail feels like flax, and hangs like a rope untwisted: whereas a colt of two years has a flat coat, and straight ears like a grown horse.

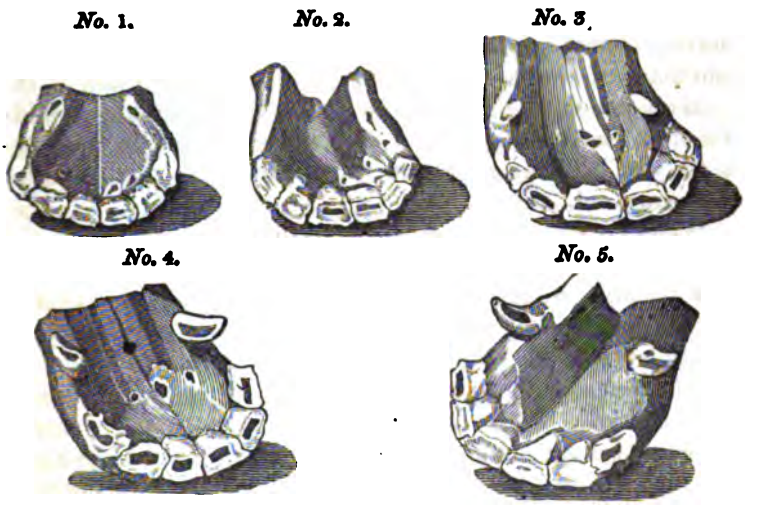
At about two years and a half old, sometimes sooner, sometimes later, according as he has been fed, a horse begins to change his teeth. The pincers which come the first, are also the first that fall; so that at three years he has four horse's, and eight colt's teeth, which are easily known apart, the former being larger, flatter, and yellower, than the other, and streaked from the end quite into the gums.

These four horse pincers have, in the middle of their extremities, a black hole, very deep; whereas those of the colt are round and white. When the horse is coming four years old, he loses his four separaters, or middle teeth, and puts forth four others, which follow the same rule as the pincers. He has now eight horse's teeth and four colt's. At five years old he sheds the four corner, which are his last colt's teeth, and is called a horse.

During this year also, his four tusks (which are chiefly peculiar to horses) come behind the others; the lower ones often four months before the upper; but whatever may be the common opinion, a horse that has the two lower tusks, if he has not the upper, may be judged to be under five years old, unless the other teeth show the contrary; for some horses that live to

be very old never have any upper tusks at all. The two lower tusks are one of the most certain rules that a horse is coming five years old, notwithstanding his colt's teeth may not be all gone.

Figure 1 of the annexed engravings of the horse's teeth, represents them at 2 years and a half old; fig. 2, at three years old; fig. 3, at 4 years; fig. 4, at 5 years; and fig. 5, at 6 years.



It is not an unfrequent practice of jockies and breeders, in order to make their colts seem five years old, when they are but four, to pull out their last colt's teeth; but if all the colt's teeth be gone, and no tusks appear, the purchaser may be certain this trick has been played: another artifice they use, is to beat the bars every day with a wooden mallet, in the place where the tusks are to appear, in order to make them seem hard, as if the tusks were just ready to cut.

When a horse is coming six years old, the two lower pincers fill up, and instead of the holes above mentioned, show only a black spot. Betwixt six and seven the two middle teeth fill up in the same manner; and between seven and eight the corner teeth do the like; after which it is said to be impossible to know certainly the age of a horse, he having no longer any mark in the mouth. In this case recourse can only be had to the tusks, and the situation of the teeth.

With respect to the tusks, the purchaser must with his finger feel the inside of them from the point quite to the gum. If the tusk be pointed flat, and have two little channels within side, he may be certain the horse is not old, and at the utmost only coming ten. Between eleven and twelve the two channels are reduced to one, which after twelve entirely disappears, and the tusks are as round within as they are without; he has no guide then but the situation of the teeth. The longest teeth are not always a sign of the greatest age, but their hanging over and pushing forward, as also their meeting perpendicularly, is a certain token of youth.

Many persons, whilst they see certain little holes in the middle of the teeth, imagine that such horses are but in their seventh year, without regard to the situation the teeth take as they grow old.

When horses are young, their teeth meet perpendicularly, but grow longer and push forward with age; besides, the mouth of a young horse is very fleshy within in the palate, and his lips are firm and hard: on the contrary, the inside of an old horse's mouth is lean both above and below, and seems to have only the skin upon the bones. The lips are soft and easy to turn up with the hand.

All horses are marked in the same manner, but some naturally and others artificially. The natural mark is called begue; and some ignorant persons imagine such horses are marked all their lives; because for many years they find a little hole, or a kind of void in the middle of the separaters and corner teeth; but when the tusks are grown round, as well within as without, and the teeth point forward, there is room to conjecture, in proportion as they advance from year to year, what the horse's age may be, without regarding the cavity above mentioned.

This artificial manner is made use of by dealers and jockies, who mark their horses after the age of being known, to make them appear only six or seven years old. They do it in this manner: they throw down the horse to have him more at command, and, with a steel graver, like what is used for ivory, hollow the middle teeth a little, and the corner ones somewhat more; then fill the holes with a little rosin, pitch, sulphur, or some grains of wheat, which they burn in with a bit of hot wire, made in proportion to the hole. This operation they repeat from time to time, till they give the hole a lasting black, in imi-

tation of nature; but notwithstanding this fraudulent attempt, the hot iron makes a little yellowish circle round the holes like that which it would leave upon ivory; they have therefore another trick to prevent detection, which is to make the horse foam from time to time, after having rubbed his mouth, lips, and gums with salt, and crumbs of bread dried and powdered with salt. This foam hides the circle made by the iron.

Another thing which they cannot accomplish, is to counterfeit young tusks, it being out of their power to make those two crannies above mentioned, which are given by nature; with files they make them sharper or flatter, but then they take away the shining natural enamel, so that one may always know, by these tusks, horses that are past seven, till they come to twelve or thirteen. The figures prefixed to these remarks on horse's teeth, will illustrate the preceding hints; being drawn from the teeth themselves, at the various ages therein specified.

In Yorkshire, and the midland counties, the young stock are generally kept until rising three or four years old; but many are sold at an earlier age, particularly from the Lincolnshire fens. The method practised by the Yorkshire farmers in making up their two year old colts for sale, is, to take them up from grass in the autumn, only a week or two before the time they are to be sold, in order to reduce their carcass, improve their coats, and teach them to lead; and they are then disposed of, with their full tails, to dealers, who afterwards make them up more according to art. They first draw their corner teeth, in order to make three or four year old horses have the mouths of those of five; they also undergo the operations of docking and nicking, and after being kept on mashes made of bran, ground oats, or boiled corn, they are sold to the London dealers, who sell them as if they were five year olds: they are then taken into immediate work, and in a few months many of them are completely destroyed by premature and severe labour. But this drawing of the teeth is not a fraud practised on the London dealers, who are, on the contrary, not only aware of the deception, but require it to be done; it must, indeed, be effected some months previous to the final sale, or the tooth which denotes a horse to be five years old would not be grown *.

* Agricultural Survey of Yorkshire, North Riding, p. 277.

With regard to the circumstances indicating a *sound horse*, it may be observed, that where a horse is free from blemish, the legs and thighs are well shaped; the knees straight; the skin and shanks thin; the back sinews strong and firm. The pastern joints should be small and taper, and the hock lean, dry, and not puffed up with wind. With respect to the hoof itself, the coronet ought to be thick, without any tumour, or swelling; the horn bright, and of a grayish colour. The fibres of a strong foot appear very distinctly, running in a direct line from the coronet to the toe, like the grain of wood. Such a foot, however, ought to be kept moist and pliable; as it is subject to fissures and cracks, by which the hoof is sometimes cleft through the whole length of the coronet. A narrow heel is likewise a great defect; and, if it do not exceed two fingers in breadth, it forms an imperfect foot. A high heel often causes a horse to trip or stumble; while a low one with long yielding pasterns, is apt to be worn away on a long journey. On the other hand, a foot disproportionately large, renders the animal weak, and clumsy in its gait.

The head of a horse ought to be small, and rather lean than fleshy; his ears should be erect, thin, sprightly, and pointed; the neck arched towards the middle, tapering gradually towards the head; the shoulders rather long; the withers thin, and enlarged by degrees as they extend downwards, yet so as to render his breast neither too gross nor too narrow. Such are the principal marks by which the best form and proportion of that useful animal may be determined, without reference to the deviations from those general rules which characterize the cart-horse, and which have been already noticed.

CHAPTER VI.

ON THE MAINTENANCE AND LABOUR OF FARM-HORSES.

The support of horse-teams forms so material a portion of farming expenditure, that, although not immediately connected

with grazing, a few observations on the subject may not prove uninteresting; especially as leading to a calculation of their value, as labouring cattle, when compared with oxen.

1. The methods of *stable keeping* are so various, and the prices of provender so fluctuating, that no estimate of the expense can be framed with precision; but, reckoning the average consumption of oats by well-fed farm-horses at ten quarters, with a couple of quarters of beans for occasional hard work, and of hay at two loads,—the respective prices being, at an average, of the last few years,—the annual charge, including four months' summer-soiling and the farrier's bill, may, perhaps, be computed at from *26l.* to *32l.*, without any allowance for straw, and, of course, calculating corn and hay at their value on the farm. There are, no doubt, many men who keep their teams much more expensively, from the mere vanity of having them in high condition; and others who employ very powerful cattle for heavy road-work, and which must of necessity be higher fed; but for the medium-sized horse, adequate to common farm labour, that is a sufficient, and even liberal allowance: in proof of which, the following instances, from the practice of some eminent farmers, will probably suffice.

1. Mr. Harper, of Bank Hall, Lancashire, ploughs seven acres per week, the year through, on strong land, with a team of three horses, and allows to each, weekly, two bushels of oats, with hay during the winter six months, and during the remainder of the year, one bushel of oats and green food*.

2. Mr. Ellman, of Glynde, in Sussex, allows, weekly, two bushels of oats, with pease-haulm, or straw, and but very little hay, during thirty winter weeks, and one bushel of oats, with green food, during the summer†.

3. Mr. Wakefield, of Burnham, and Mr. Wright, formerly of Rochford Hall, in Essex, allowed two bushels of oats per week, with two tons of hay, during the winter months; and for nearly five summer months turned their horses to grass, without any allowance of oats‡.

4. Mr. Richard Parkinson, of Doncaster, fed his horses, which were employed on heavy road-work, as well as the common business of his farm, on beans with oats in the straw, and some wheat-straw only, without any hay whatever. They were in perfect working order; and being kept entirely in the stable, their annual allowance was two-thirds

* Agricultural Survey of Sussex, p. 381.

† Ibid. p. 378.

‡ Agricultural Survey of Essex, Vol. II. pp. 354, 355.

of an acre of cut unthrashed oat-straw, the same quantity of wheat-straw, incompletely thrashed, and about thirty-six bushels of beans*.

The latter account is deficient in accuracy, from no estimate having been made of the probable quantity of oats contained in the straw; but as the gross value, per acre, is estimated at ten guineas, and, in another comparative account of the cost of feeding in the common way, oats are charged at the rate of thirty shillings per quarter, the amount may be fairly calculated at six quarters, allowing thirty shillings for the straw; thus, leaving four quarters of oats, and four and a half of beans, with straw only, as an entire year's keep for a working horse: and it is also worthy of remark, that the horses thus fed were previously kept, while at the same work, on a larger allowance of oats and beans, with hay. The accounts, which are made out for the yearly keep of nine horses, are as follows:—

OLD METHOD.

	£	s.	d.
To Hay	71	19	0
Two quarters of oats weekly, 104 qrs. at 30s.	156	0	0
Nine bushels of beans weekly, 468 bs. at 6s.	140	8	0
OLD METHOD	368	7	0
NEW METHOD	206	14	0
Balance in favor of the improved mode	161	13	0

Or £18 per horse, per annum.

NEW METHOD.

	£	s.	d.
To six acres of wheat scouge, at £2 2s. per acre	12	12	0
Value of wheat supposed to be left in do. £1 1s. per do.	6	6	0
Six acres of oats in the straw, at £10 10s. per do	63	0	0
Cutting straw; one man, 52 weeks, at 12s. per week	31	4	0
Six bushels of beans weekly, 312 bs. at 6s.	93	12	0
	206	14	0

The difference, including even the value of the straw, of which farmers generally make no account, is, indeed, extraordinary; and if, as Mr. Parkinson pledges himself, the horses were in equal condition while kept in each way, it merits the most serious consideration. But although it may be difficult to admit the possibility of that, to the full extent stated, it yet can-

* Treatise on Live Stock, Vol. II. p. 168.

not be doubted that the horses were equal to the work on which they were employed, which appears, from his statement, to have been much more severe than common farm labour.

It will not escape observation, on examining the above account, that the cost of cutting the straw would have supplied each horse with a load of the best hay, at the average farm price. According to the average acreable produce of straw, it amounts to more than a guinea a load *; which is a serious drawback upon the economy of the practice. But to have occasioned this great expense, it must have been chopped very fine, which is not merely unnecessary, but even objectionable; for mastication will be better effected if it be cut rather long, and that operation is of the first necessity as regards the digestion, and consequently the nutriment of the animal. In the south of Europe, more particularly in Spain, where many fine horses are bred, hay is generally unknown; and the straw, upon which, with barley, they are wholly kept, is always given only partially cut, as rack-meat, and never as chaff.

In Kent, however, but more especially in the eastern part of that county, the teams are kept entirely upon short-cut straw and unthrashed oats, given in the manger: the oat-sheaves being estimated to produce about seven bushels of grain weekly for a team of four horses: or, if clean corn be given, the common allowance is four bushels of oats and two of beans; and some farmers, it appears, neither allow corn nor hay, but give about two hundred weight of bran, per week, to a team, with an unlimited quantity of straw, and perhaps a small portion of sainfoin hay cut into chaff †.

In order to reduce still farther the expense of horse-keep, various trials have been made of the nutritive powers of pota-

* The average produce of straw, per acre, has been calculated by Mr. Middleton, in his Survey of Middlesex, as follows: viz.

Wheat.... 31 cwt.
Oats..... 25
Barley 20

But that must have been from crops beyond the common average; for it has been found, that twelve bushels of thrashed wheat will not generally produce more than a load, or 11½ cwt. of straw, allowing, besides, 1½ cwt. for chaff and stubble: the quantity must also vary in different seasons, and on different soils. Wheat-straw is the most, and barley-straw the least, nutritive.

† Agricultural Survey of Kent, 2d Edit. p. 183.

toes, Swedish turnips, carrots, and other esculent roots, all of which have been found sufficient to the support of the cattle, for moderate work, when given with abundance of hay: they have even been found to answer the purpose when given with straw only; but, in that case, the labour must have been very gentle, for horses must have food of a quality proportioned to their work, and, if that be considerable, some corn is absolutely necessary. The quantity commonly given may, indeed, be diminished with the aid of roots, and straw may be substituted for hay; but, in every instance, the food must be in proportion to the required exertion, or the horse will be injured in a greater degree than the saving effected in his keep; and although theorists adduce instances to the contrary, every practical farmer knows, that hard work can only be sustained by good feeding. But even this may be carried to excess; and although farmers cannot be generally accused of being too lavish of corn, yet the allowance of hay is commonly far too profuse. It is, indeed, a common practice to rack-up with an unlimited quantity of fodder; the consequence of which is, that gross feeders remain feeding half the night, instead of lying down to rest; their stomachs become unnaturally distended; and many serious disorders are thus generated, which might be avoided by a more regular, and a more limited allowance.

Of the esculent roots, sliced potatoes and carrots are those most commonly given; and it is a singular fact, that although the former contain the greatest proportion of nutritive matter*, yet horses thrive best upon the latter. When potatoes are steamed, and thus deprived of the water of which they are in great part composed, and which is, with much probability, supposed to have a pernicious effect, they then, indeed, form a tolerably substantial food; but the trouble and expense of the process are great objections to giving them in that way, and, when raw, carrots are preferable: horses are fonder of them; they have a visible good effect upon the coat; are found advantageous to the wind; and correct the binding effect of dry food.

II. So much of what has been already said on the subject of soiling neat cattle†, is applicable to the SUMMER FEEDING of

* See Book XI. Chap. VI.

† See Book I. Chap. IX.

horses, that only a few more observations are necessary. The common modes are,—1, to turn them out on pasture; 2, to feed them, in the field, on artificial grasses, either cut, or grazed; and 3, to soil them on green food, in the stable or yard: each method has its advocates, and the choice of either must, in great measure, depend upon the convenience, as well as the judgment, of the farmer.

The *first method* is, properly enough, adopted on farms which have a large proportion of grass land, and are not within reach of a market for hay. Horses thus kept are perhaps more healthy than in any other way, if the herbage be abundant and good; but one great disadvantage attending it is, the time lost every morning in getting them up; to obviate which, their range should be limited, and where the enclosures are large, they should, if possible, be divided by hurdles, by which also, the grass will be less trampled, and the cattle will have the advantage of fresh pasture.

The *second* is customary on arable farms; and when properly conducted, is a most advantageous mode of disposing of green crops not intended for hay. The horses are, however, too commonly turned on the land to graze, and thus destroy, by treading, more food than they consume. Some farmers, indeed, argue that the vegetable matter thus trodden into the soil, and saturated with dung and urine, forms a complete coat of manure without the labour of spreading; but they omit the advantage that would be derived from feeding double the number of stock, and the return to the land of double the quantity of dung. It is, indeed, a slovenly and wasteful practice, which cannot be too much reprobated; and which admits of the less excuse, as it can be avoided by hurdling off the quantity intended to be used each day, and giving it cut, in cribs, or even on the ground.

The *third* is not a more economical practice, so far as regards consumption, than if the food were given, cut, in the field, and it is attended with the further expense of cartage to the homestead; but it is more profitable in respect to manure, as the fertilizing properties of the dung and urine are speedily exhaled by the sun, when dropped in detached portions upon the land, whereas they may be easily preserved when gathered in heaps *.

* See Book XII. Chap. II. Sect. 1.

Horses are also more in readiness for their labour when kept in the farm-yard, than in the field; and are cooler when under shelter, and less exposed to be teased by flies, than when abroad in hot weather. The purer air of the field is no doubt, however, better for the health of all cattle, and they are found to feed better in the open air than when confined; but the superiority of this mode, in regard to manure, is unanswerable. The only way, perhaps, in which soiling in the field can in that view bear a comparison with it, is, when the land under the green crop is intended to be immediately ploughed and sowed, as, for instance, when turnips follow tares; in which case, if there be sufficient stock to eat off a large quantity, at once, it may be advisable to feed them on the ground, and plough the manure under, before its value is exhausted.

III. Of equal importance with the feeding of horses is the MANAGEMENT of them, when their daily labour is performed; but concerning the best mode of doing this a considerable difference of opinion prevails. By some it is remarked, that the keeping of horses in stables, with separate stalls for each, so that they may feed quietly and be expeditiously harnessed, is, in every respect, the most preferable method; provided a free current of air pass through the stables. Others, on the contrary, assert that sheds, open to the front, with racks and mangers fixed below, and having a pump and cistern, as well as a small yard, in which they may run at pleasure, are superior to the stable method; because, if well littered, the horses will not require any other dressing than is usually given by farmers' servants. Since, however, these animals are very susceptible of cold, it would perhaps be most advisable to keep them in stables, in all exposed and bleak situations; but, in mild and sheltered places, the shed-system will be found the most profitable. Where the practice has been followed, it has been found generally successful; and it has been remarked, that horses thus managed are not only more healthy than those kept in stables, but also attain to greater age.

Carters are very generally neglectful—not, indeed, of feeding their horses, for they will seldom hesitate to steal corn for the purpose of pampering them, but of that care which requires labour; and masters too commonly permit these servants to manage the teams nearly as they please; the consequences of which are

frequently injurious to the animals' health. It is not necessary that farm-horses should be groomed like hunters: much use of the curry-comb might indeed be rather prejudicial in winter to cattle that are constantly employed at slow work for many hours together in all kinds of weather, for it would deprive them of too much of the long coat, with which nature provides them, as a protection against the inclemency of the season: but that argument will not hold against the necessity of cleanliness. The fetlocks of cart-horses are commonly covered with a profuse quantity of hair, and, in flinty soils, it forms a very desirable protection against cuts; but if not daily cleansed from the dirt, which it collects, the accumulation at length occasions that unsightly and stubborn disease, grease. In like manner, perspiration mats the coat, and clogs the roots of the hair with scurf, which produces eruptions on the skin that are often difficult of cure. It should, therefore, be a settled rule that, whether the horses are kept in the stable, or not, their feet should be regularly washed on their return from labour, and that they should be well wisped over until they are dry. The wisping, indeed, should never be omitted, at least every evening, even when they have not left the stable; and the hooves should be occasionally oiled and stopped. The feet require more care than is usually bestowed upon them in farm stables, and nothing occasions them more injury, than the reprehensible practice of letting horses stand upon their litter until it ferments, as well as the common, but very mistaken, economy, of not shoeing sufficiently often. The state of the body should be constantly attended to, and when hard meat is given, it is an excellent practice to allow a cold bran mash every Saturday night: if also on that day the field labour were abridged an hour or two, and the time devoted to cleaning and oiling the harness, it would not be thrown away. The stable should be kept not only clean, but sweet, for the horse has a strong dislike to every offensive smell, and fresh air should be constantly admitted; besides that the pungency of the vapour arising from fermented dung occasions injury to the eyes. If sheds are used, care should be taken that the litter be dry, and that the roof effectually keep out the rain; and above all, it should never be forgotten, "that the eye of the master fattens the horse."

IV. The LABOUR performed by farm-horses, is a consideration of equal importance with their food; but the subject is not so

generally understood, for their power is commonly ascribed wholly to their strength, whereas it consists, at least equally, in their action, and in this lies the chief superiority of the small active Suffolk punch, or the Cleveland bay, over the heavier, but more slow moving, Lincoln cart-horse. The operation of ploughing is usually performed at so slow a pace, that it is thought of no consequence that the cattle should be able to step more briskly, and in very heavy soils, where the plough works with difficulty, such reasoning may be just; but it is obvious, that the quicker a horse steps, the more ground he will cover within a given time, and therefore action is material on lighter land, where the resistance is less. Another argument used against brisker motion is, that if the horses stepped faster, the ploughman could not keep pace with them; but the fallacy of this must be apparent, when it is considered that the average day's ploughing, on medium soils, and working nine hours, does not exceed a statute acre: which, also supposing a common furrow-slice of nine inches wide, will only amount to eleven miles, and, allowing another for the turnings, a mile and one third per hour; whereas, if the plough be not much impeded, either by the tenacity of the soil, stones, or other unusual obstacles, a good workman will find no difficulty in following it at even double that rate. It may, indeed, be doubted whether either man or horse could constantly sustain such labour: and on that ground the value of quick action might be again questioned; but the advantage of being able to perform it on pressing occasions cannot be denied, and even supposing only one acre to be ploughed, it must be admitted, that both would be benefited by completing their task within half the usual time. By this reasoning it is not, however, meant to be contended that such exertions can be always made; but it is well known, that an acre and a half are frequently ploughed in Norfolk, while it is equally notorious, that on similar light land in many other counties, a single acre is the usual limit; and it is therefore evident, that there is still great room for improvement, which these remarks are intended to stimulate.

The following has been ascertained to be the quantity of land actually ploughed, and the ground gone over, by a team in nine hours, walking at the different rates per hour, and turning the different furrow slices, as specified.

		At 1½ mile per hour.				At 2 miles per hour.		
		A.	R.	P.		A.	R.	P.
Breadth of the furrow slice.	8 IN. ..	0	3	36	..	1	1	7
	9 ..	1	0	14	..	1	1	33
	10 ..	1	0	35	..	1	2	21
	11 ..	1	1	14	..	1	3	5

The distance travelled in each instance was, at the slow pace, within a fraction of twelve, and at the quicker, sixteen miles: thus it appears, that in the first three instances the additional quantity of land ploughed was about one third, or in nearly equal proportion to the increase of pace; but that upon the eleven inch furrow the additional quantity amounted to nearly the half.

CHAPTER VII.

ON THE COMPARATIVE MERITS OF DRAUGHT OXEN AND HORSES.

FEW subjects have, of late years, more exercised the ingenuity of theorists, or engaged the attention of farmers, than the question concerning the superiority of oxen, or of horses, for the purposes of agricultural labour. Although, in some measure, irrelevant to the mere subject of grazing, yet, as their comparative merits must materially govern their employment, and consequently affect the general business of the breeder and the grazier, we shall take a summary view of the arguments in favour of each. These comprise the following heads; *their respective cost, maintenance,* and *aptitude to labour;* and may be thus stated:—

In *favour of oxen,* it is affirmed:—

I. That they cost less, and are less liable to accidents and disease. That they increase in value to the age of

seven or eight years, and are then fit for the grazier; while horses decline in value after they become aged, and are then only worth their skins.

II. That they are supported at a less expense of both food and attendance than horses; and that their gear is less costly.

III. That they are more steady at the draught; which is a great advantage in breaking up strong leys, and other heavy work, in which horses are apt to fret; and that, if well fed, they will perform nearly, if not quite, as much work.

In *favour of horses*, it is alleged:—

I. That although *singly* oxen are cheaper than horses, yet, that the purchase of a *team* of equal capability is quite as expensive.

That oxen can only be worked with advantage for about four years; and that if horses were not worked for a longer time, they would increase even more in value, and if then sold would leave a larger profit.

II. That although supported at a greater expense than oxen, they perform a proportionately greater quantity of labour; and that their gear is not more costly than that of oxen, when the latter are worked, according to the modern usage, in harness.

III. That if less steady, at heavy draughts, than oxen, they yet perform their ordinary work better and more expeditiously; that they do more of it in a day; and are not only equal to their customary labour every day, but will bear extra fatigue on pressing occasions; while oxen cannot support any extraordinary exertion, and if much employed on road work are apt to become foot-sore.

In support of these several assertions, various calculations have been made, which it would be tedious to enumerate; and in fact but little reliance can be placed on the greater number, for, having been generally produced in support of a particular system, they have been often made on false data. The results of numberless trials of the respective powers of the two animals have also been adduced in favour of each; and although these are entitled to greater attention, yet, to command entire

confidence, they should be made during a long period, with teams of each kind of cattle worked on the same ground, and at the same labour; minute accounts should be kept of their first cost, charges of keeping, and final sale; and when these *pecuniary* results have been obtained, the *expediency* will then remain to be considered of having the work slowly or expeditiously performed.

Some trials have shewn, that three oxen, if highly fed, are equal to the work of two horses; but the additional expense thus created, of superior keep, destroys the supposed advantage of economical food. It must also be observed, that oxen, if worked to the extent of their power, will become of little value to the grazier; for they cannot stand hard work, and maintain high condition; and if once reduced, it is afterwards extremely difficult to restore their flesh. Experience has, indeed, proved that, keeping in view the profitable sale of oxen, and working them accordingly, four will be required to perform the labour of two horses; and that is now almost universally admitted to be the proper calculation. It will not, therefore, be far from the truth if the money account be stated thus:—

HORSE TEAM.

A common allowance for each horse employed in mere farm labour is, *per week*, two bushels of oats, one truss of clover hay in chaff, with an unlimited quantity of straw, pea or bean haulm, and barn chaff; the value of which, *for two horses*, from the beginning of October to May, or about thirty weeks, may be estimated as follows:—

	s.	*d.*	
4 bushels of oats, at 24*s.* per quarter	12	0	
2 trusses of clover, at 3*l.* 12*s.* per load	4	0	
Straw, &c., estimated at	4	0	
			£30 0

During summer the allowance of oats is usually reduced to one half; and if soiled, one horse will consume about a square perch of tares per day, or other green food in proportion: the weekly account for the remaining twenty-two weeks will then be

	s.	*d.*	
2 bushels of oats, at 24*s.* per quarter	6	0	
14 perches of tares, at £4 per acre	7	0	
			£14 6

Brought forward	£44	6
Stable expenses, farrier, and wear of harness £2 each *per year*	4	0
Decrease in value, £3 each do.	6	0
	£54	6*

OX TEAM.

An ox will consume at least half a truss of meadow hay per day, if fed on hay alone; but assuming only half that quantity to be allowed, and that he will then only eat the same value of straw, haulm, or turnips, as a horse, during an equal period of the winter, the account for thirty weeks *for four oxen* will stand thus:

	s.	*d.*		
7 trusses of meadow hay, at £3 per load	11	8		
Straw, &c.	8	0		
			£29	0

In Summer, an ox will consume more green food than a horse, and more especially when the latter is partially fed on oats: and, calculating that excess at one fourth more, the four will consume, *per week*, in twenty-two weeks,

35 perches of tares, at £4 per acre, 17*s.* 6*d.* or	£19	5
Farrier, and wear of gear, £1 each, or *per year*	4	0
	53	5
From which deduct for increase in value, £3 *per year* each	12	0
	41	5†

* This calculation it will be observed, has been made for horses employed solely on farm work, without reference to extra road labour, for which higher keep would certainly be necessary. Should it be objected, by those who pamper teams of unwieldy horses, from the vanity of having them in high condition, "that the allowance is insufficient," it may be answered, that it is taken from the accounts of an extensive and well cultivated farm.

† The common calculation is, that a working horse consumes food in the proportion of about 4 to 5 to a working ox. This has been ascertained, as nearly as possible, where so much depends upon the constitution of the individual animals subjected to the trial, by various experiments, of which it may be sufficient to mention the following:—

Three working horses about 15½ hands high, ate in 14 days, 96 stone of hay; which is for each horse 16st. per week, with 12 gallons each, per week, of oats.

In 15 days 4 Durham oxen ate 164st. 7lb. of hay, which is for each ox 19½st.

The balance will thus appear to be about 13*l.* per year, in favour of the ox team: but even admitting it to be more, there are then the important considerations of the superior execution of the work, and the expedition of horses; the last of which, at seed-time, harvest, and other catching moments, is frequently of the last consequence to farmers. It is also to be observed, that the preceding calculation has been framed on the supposition that the horse is worked out in ten years, and costs 30*l.*; whereas with good treatment he will last much longer, and if a similar system were pursued to that of working oxen, he might be bred for less money, and be sold, at maturity, with profit. To this estimate of his value, there is also to be added the *convenience* of possessing the same working animal for a long series of years; while the ox must be changed at short periods, besides the trouble of breaking him to the yoke.

In confirmation of the truth of this statement, is the fact, that ox-teams are very generally going out of use; and, as the farmers who have tried them must be allowed to be the best judges of their real value, this must be admitted as a decisive proof of the superiority of horses. But assuming this, on general grounds, it does not follow, that oxen may not be advantageously employed in all the common routine of farm labour, when dispatch and extra exertion are not required. A proportion of them may, therefore, be very justly recommended; particularly on farms which contain a considerable quantity of pasture land; and, indeed, it must be admitted that, for some kinds of work, of a slow and heavy nature, as carting dung, and dragging timber, the ox is better adapted than the horse; for he is both more patient, and better able to withstand the effects of alternate heats and cold, to which he is then exposed.

An argument very commonly used in favour of oxen is, that their employment would produce a larger supply of food for the community. However plausible this may appear, much

per week, with 10½ gallons each, per week, of oats. It should, however, be remarked, as a singular fact well worthy of attention, that the same oxen, when fed on hay alone, only consumed 20st. each per week, or only 10½ lbs., more of hay, though deprived of as much oats as should have weighed 50lbs.

An unworked ox, 3½ years old, and an idle horse of 15½ hands, both put up on good old hay, consumed for several days together, at the rate of 33lbs. for the ox, and 28lbs. for the horse. *See the Agricultural Survey of Northumberland, 3d edit.* p. 135.

might be adduced in opposition; but it is a purely national question; and, as the farmer can only be expected to view it as it regards his individual interest, the discussion here would be superfluous. It may, however, be observed, that the advocates for the sole employment of oxen disregard the injury that would thereby be done to the stock of horses, many of which, for the use of the army and of carriages, are bred from cart-mares. Nor should it be forgotten, that, so far from increasing in value after four years old, an ox, under the present improved system of breeding, is of more value to the butcher, when properly fattened, at four years old; and will produce as much, if not more beef at that age than if worked three years longer, and then only fattened during the same period, and with the same consumption of food, as at the earlier age.

CHAPTER VIII.

OF ASSES AND MULES.

ALTHOUGH so little employed in this country as scarcely to be enumerated among agricultural stock, yet, when reared with care and properly treated, these animals may be rendered extremely serviceable, and are therefore deserving of the farmer's attention.

I. ASSES, when domesticated, are remarkable for their meekness, patience, tranquillity, and (though too often treated with harshness) attachment to their masters. No beasts, perhaps, are capable of supporting heavier burthens, in proportion to their size, than asses; on which account they are principally employed in drawing hucksters' carts. But it appears from actual experiment, that these useful animals may be employed, to great advantage, in drawing waggons, and other carriages.

Thus the Earl of Egremont, early in 1800, formed a team, consisting of six male asses, and, during nine months, he found them of great service. They brought one chaldron and a quarter of coals twice a day, in a waggon, from the canal to his lordship's house at Petworth, which shows a degree of strength not to be expected of them; they were gentle and docile, and during winter they had no oats, nor any other hay than the bands of the trusses consumed by horses, but lived on furze and holly*.

A more striking instance of the utility of asses for the purposes of draught has been communicated to the public by a gentleman named Worthington, who made use of the implements in common use, except as to size, accommodating the height of his wheels, &c. to the line of draught, enabling his asses to draw without any inconvenience; and employed them in various departments of agricultural labour. His practice was to work four asses at plough, yoked two a-breast, driven in hand with reins by the ploughman; and he found that they were more than masters of the work required from two common farmer's horses of a slight kind. Mr. W. esteemed an acre a good day's work; but in cross-ploughing they would do more: at such work two asses were sometimes enough, and two were also sufficient in turning the furrow at potato-planting. The soil on which these animals were employed, was a loamy stone brash, of middling but varying depth, and tenacious rather than light.

"In respect of consumption," concludes Mr. Worthington, "I can only add, that the ass is a temperate eater; and that he appears to thrive best when left at large to his bramble-leaves (which flourish almost through the whole winter), with a little corn at his breakfast and at the close of work, and a bite of hay at noon in his gears; and he may also be safely trusted abroad with his associates, as, unless in his rutting season, he scarcely ever strays. He loves grains, and will eat them freely; and is fond, beyond any other food, of the culinary roots, in particular of potatoes and carrots."

To this it may be added, that he appears to be exempt not only from the contagious disorders often so fatal to other cattle, but even from all ailments whatever; that he will undergo great

* Annals of Agriculture, Vol. 37.

fatigue; and that he is very long lived. It may, however, be doubted, whether his qualifications, as a beast of draught, will ever introduce him into our farmers' teams; but, as a beast of burthen, he may be rendered extremely useful, in clearing green crops from land that will not allow of carts in a wet season, and in many other odd jobs about a farm, more especially in hoeing. They have indeed been already employed for both these purposes in Leicestershire and Essex: the surveyor of the former county states, that two or three were constantly kept at Lord Moira's for the purpose of carrying turnips, cabbages, and other green food for the supply of the live-stock; being worked by boys, or superannuated old men or women. They carried 200lbs. weight each, in panniers, constructed to open at bottom, and thus let the load out at once; and were considered very serviceable stock*. In Essex, they are mentioned as having been used for hoeing drilled wheat, pease, and beans, with a small but effective skim, with a boy to lead, and a lad to hold: two acres were done in a day, at nine inches †. It must also be obvious, that to farmers in hilly countries, as in Devonshire, where horses are commonly employed to carry many small articles to market, they might be rendered extremely useful, while the cost of keeping them is not worth calculation.

There are two, almost distinct, species of the ass: the one gray; the other brown, sometimes approaching to black. The former is the largest and the strongest; but he is also the most dull, and seems to merit much of the character for stupidity attributed to the whole race. The latter is of a light, and even handsome, form, and lively disposition, and is particularly suited to the saddle, for which purpose he is very generally used by ladies in Portugal and Spain, where they are bred of a very large size: but he there wears a very different appearance from that of the wretched *donkeys* now in vogue at our fashionable watering-places. He is first saddled with a pack, which covers the entire back from the shoulder to the loins, and is raised and peaked upwards at the pommel, to prevent the weight of the rider from pressing forward; on this a smaller cushion is laid, and secured by a kind of arm-chair with legs curving round the

* Agricultural Survey of Leicestershire, p. 293.

† Agricultural Survey of Essex, Vol. I. p. 152.

sides of the saddle, and having a small hanging board, instead of a stirrup, to rest both the feet; the lady sitting sidewise. The entire caparison is covered with cloth or velvet or morocco leather, of the gayest colours, and the breast-plate and bridle being embroidered in party-coloured worsted, the whole, when placed upon a well fed and well broken brown male ass, forms a set-out that is very far from contemptible.

They require very little more attention in rearing than occasionally to pare their hooves, which are otherwise apt to grow long at the toe and narrow at the heel, thus rendering them liable to stumble; but they are naturally very sure-footed; and if trained with gentleness, they will be found very docile; their intractability being generally the effect of ill treatment.

II. MULES are a mongrel kind of animal, partaking of the nature of both the horse and the ass. They are hardy, strong, and sure-footed, live to a great age, and, being maintained at less expense than horses, they might be very advantageously employed on farms. They are the only beasts of burthen used in the south of Europe; and in Spain and Portugal they are employed both for the saddle and in gentlemen's carriages. For the latter purpose, they are bred of a very large size, and sell at much higher prices than horses*, as they not only live longer, and are less subject to disease, but are found to go through more work, and to stand it better. The common load for Spanish mules, besides a heavy pack-saddle, is 280 lbs., or 20 stone, and with that they will travel, for days together, at the rate of from thirty to forty miles: their only food is barley, or Indian corn, and straw, upon which they are kept in excellent condition; and when not ill-treated will continue to labour for thirty, and even forty years.

It must be evident, from this slight sketch, that these animals might be rendered very serviceable for many purposes for which horses are now employed: they are steady pullers, standing well to the collar at up-hill draughts, at which horses would stand still, and are more muscular, in proportion to their size, but, not possessing equal weight, they have not the same power.

* In Lisbon, a pair of carriage-mules have been known to fetch as much as 250 moidores, equal to £337 10s.; and a good pair can seldom be obtained under 150 moidores.

For ploughing land that is subject to be poached by heavy cattle, for hoeing and harrowing, and for all kinds of light road-work, they would, however, be found a cheap and effective substitute for the expensive teams in general use. They are, indeed, already partially employed in some places: they have been long since introduced into Ireland, and used there with advantage*; and, in Leicestershire, the following testimony in their favour was given some years ago by Mr. Dawson, steward to the late Lord Moira, who bred a considerable number. He used them in the plough, and had sent two of them with a caravan to Scotland; and he considered them capable of travelling any length, being possessed of more hardiness, patience, and perseverance, than horses, and able to subsist on much coarser food. This gentleman says, "that so far from meriting the character they bear for restiveness, when such a disposition was shewn it was owing to ill treatment, and the perverseness of their managers; that they have a strong sense of injuries received, and act accordingly; but that, when managed with humanity and gentle treatment, no animal is more docile, or more easily governed:" † to which we can add our own testimony of their usefulness, and good temper.

The chief objection to mules, in this country, is, that, from the smallness of their price, they will not pay for the breeding so well as horses. Nor can that be denied: but where farmers breed, as they often do, merely to keep up their own stock, they may find it even more advantageous to breed mules; for, in addition to the intrinsic worth of the animal, it may be observed, that they can be got from mares of a size not fit to produce valuable horses; and also, that when a mare has not stood her stinting, when covered by a stallion, she will, notwithstanding, generally prove in foal if afterwards covered by an ass.

It should, however, be remarked, that in this, as well as in all other similar cases, the produce will depend on the qualities of the sire and dam; and fine mules are not to be expected from weak asses and diminutive mares. The best stallion asses are obtained from Spain, and from the islands of Malta and the adjoining one of Gozo, where they are often grown to more than fifteen hands in height; but when such cannot be procured,

* See Agricultural Survey of the County of Antrim, p. 336.

† See Agricultural Survey of Leicestershire, p. 294.

the largest English asses, of both sexes, should be chosen; and by breeding from these, and taking good care of their progeny, stallions of sufficient size would probably be got in a few descents.

Mules may also be got by horses upon asses; but in that case, the produce is a different kind of animal from the more common species, of which we have been treating; partaking more of the appearance of the horse, but less of his valuable qualities.

Mules are generally incapable of procreation; though some exceptions to this rule are known to have occurred. It seems, indeed, to be a principle in nature that all *hybrid* animals—as those are termed which are the offspring of males and females of different race—should be sterile; for did they possess the power of propagating their species, many of the animal tribes which are not so distinct as to entertain a mutual repugnance to coition, although they may not belong to the same class, would become blended together, and the genuine breeds would be lost. The axiom, it must be admitted, has been combated by some very able naturalists, and instances to the contrary have been adduced; but its general truth is confirmed by the fact, that we nowhere find a continued race of hybrids.

BOOK THE FOURTH.

ON THE BREEDING, REARING, AND FATTENING OF SHEEP.

CHAPTER I.

INTRODUCTORY AND COMPARATIVE VIEW OF THE DIFFERENT BREEDS OF BRITISH SHEEP.

Among the various animals given by the benevolent hand of Providence for the benefit of mankind, there is none, perhaps, of greater utility than the sheep: which not only supplies us with food and clothing, but also affords constant employment to numerous indigent families, in the various branches of the woollen manufacture; and thus contributes, in no small proportion, to the productive labour, and commercial prosperity and opulence of this highly favoured island.

In a wild, or natural state, the sheep is a vigorous animal, lively, and capable of supporting fatigue; when domesticated, indeed, it loses these properties, but amply compensates for the absence of them by the superior advantages arising from the rearing of this sort of cattle. In fact, sheep constitute a material part of a farmer's live stock and profits; and as particular attention has, of late years, been bestowed on the improvement of the respective breeds, we shall first present the reader with an introductory view of them; which will, we trust, convey an adequate idea of the different varieties, together with their specific characters, and the peculiar advantages they respectively

possess. The general management of these animals will afterwards form a subject of discussion.

Naturalists maintain that all the varieties of different animals, of the same species, have been derived from one parent stock; and, arguing upon this hypothesis, the origin of our native breeds of sheep has been deduced, by some from the *moufflon* of Corsica, and by others from the *argali* of Siberia, both of which still exist wild in the mountains of those countries. The moufflon is, however, mentioned by very ancient authors as a distinct animal, and, indeed, it appears to partake more of the nature of the goat; but the argali, which is spread throughout Asiatic Russia, and many parts of Persia, has much of the appearance, and many of the habits, of the common sheep. Whatever degree of credit may be attached to this conjecture, it is certain that sheep were found in a domestic state in England at the earliest period of which we have an account; it is also probable, that they were then of one species only—the small horned kind; and there can be little doubt, that the various breeds in existence at the present day, have gradually arisen through the progress of cultivation, and experiments in crossing, as well as from those differences, which will naturally arise, when they are long confined to soils of opposite quality. It might prove an object of curious research, to trace the improvements that have been made in this important branch of rural economy; but, this treatise being intended solely for the use of men of business, our inquiries are necessarily confined to the actual breeds that compose the present stock of the country, of which the following are the chief.

I. The HEATH, LINTON, SHORT, or FOREST SHEEP, depicted

above, are names indiscriminately given to the several varieties of the same breed, which is found in the north-western counties of England, and thence forward to the western highlands of Scotland.

The specific characters of this race are, large spiral horns; faces black or mottled, and legs black; eyes wild and fierce; carcass short and firm; wool long, open, coarse and shaggy; fleece averaging about three pounds and a half at four years and a half. They are of a hardy constitution, admirably calculated for elevated, heathy, and exposed districts; and, judging from this aptitude to support the hardships of constant exposure in a wild pasturage country, as well as from the form of the horns, which is characteristic of the animal in its unimproved state, it may be not improbably inferred, that they are directly descended from the parent stock of the kingdom. The true black-faced breed, is said to be distinguished by a lock of white wool on the forehead, termed the snow-lock.

In moorland tracts, where the pasturage consists rather of heather than of green herbage, these sheep have been found more valuable than some which, in more favoured situations, might be considered superior; and although they have been superseded in some instances, yet they still maintain their ground on the bleak hills of the north, many of which, indeed, would be wholly unproductive to the farmer under any other stock: their flesh is highly flavoured; and when fattened on the lowland pastures, they make excellent mutton. There is another moorland breed, of an unmixed race, existing on the Yorkshire wolds, which differs from the former, in having the face and legs white, with a thin flat carcass; but in point of hardiness of constitution, and the characteristic distinction of large horns, it is nearly similar. Both range over the heathy mountains in the summer, without any attending shepherd; and, on the approach of winter, they are brought nearer to the inclosed grounds, that hay may be given to them during deep snows, and also that they may be prepared for the severity of the season, by being salved *.

The other *horned breeds* of English sheep are—

II. The Exmoor and the Dartmoor, which derive their names from the districts in the northern and western parts of

* See p. 212.

Devonshire, where they are chiefly found. They are long-woolled, with white legs and faces, and are delicately formed about the head and neck; they make very finely flavoured mutton; and arrive, when fatted, at two and a half to three years old, to fourteen and sixteen pounds weight per quarter.

The country in which they are reared, is generally over-charged with water, after the autumnal rains, yet this breed sustains the chill of the wet ground even in the infant state, without becoming subject to the rot, which has proved fatal to some other species that have been attempted to be introduced, and even to crosses. Their summer pasture is scanty, and their winter food consists chiefly in what they can pick up, in ranging over extensive tracts of pasturage, with the assistance, in the severity of extremely bad weather, of a little indifferent hay, made from the coarse herbage of the moors, and perhaps occasionally with a small supply of turnips, which are sometimes cultivated, but which, from the wetness of the land, they are often prevented from resorting to when most wanted. From this superior hardiness of constitution, and more especially from their power of resisting wet, which is generally so fatal to sheep, nature has evidently adapted them to the soil; it is not, therefore, to be much wondered at, that the attempts made to improve them by crosses with more tender breeds, have not been attended with all the success that was expected. A cross with the old Leicester sheep has, indeed, increased the weight to twenty-four pounds per quarter; and another, with the Spanish merinos, has improved the quality of the wool; but the foot-rot and the scour have in both instances made great ravages; and until some effectual system of drainage be adopted, by which the pastures may be rendered dry, and that shelter be provided by inclosures, the most rational hope of improvement must rest upon increased attention to the native race*.

III. The NORFOLK BREED is indigenous in the counties of Norfolk and Suffolk. The horns are large and spiral; bodies long; loins narrow, with a high back and thin chine; the legs long, black, or gray; of a roving, wild disposition, and not easily confined within any but strong inclosures. The wool is short, weighing about two pounds per fleece, and the flesh is

* See the Agricultural Survey of Devonshire, p. 338.

well flavoured, and of a fine grain, but only fit for consumption in cold weather.

The agile form of these sheep, enabling them to move over a great space of ground with little labour, was of vast advantage to the old Norfolk farmers, many of whom were possessed of large tracts of heath-land, which they had no means of bringing into cultivation, except by the assistance of the fold. Mr. Marshall characterizes them, in his account of the Norfolk husbandry, as being singularly well adapted to the soil and system of management prevalent in that county: thriving upon heath and barren sheep-walks, where nine-tenths of the breeds in the kingdom would starve; standing the fold perfectly well, yet fatting freely at two years old, and bearing the drift to distant markets with comparative ease. Mr. Kent has been equally warm in their praise in his survey of the same county; yet notwithstanding these strong testimonials in their favour, they have long been giving way to the more fashionable South-down breed, which has now taken possession of nearly all, except the most barren and sandy districts of the county *.

IV. The WILTSHIRE BREED are distinguished by large spiral horns bending downwards, close to the head; they are perfectly white in their faces and legs; have long Roman noses, with large open nostrils; are wide and heavy in their hind quarters, and light in the fore-quarter and offal, but with little or no wool on their bellies. The quality of the fleece is that of clothing wool of moderate fineness, averaging about two pounds and a half in weight; and the carcasses of the wethers, when fat, usually weigh from 65 lbs. to 100 lbs.: the mutton good: they sometimes, however, reach much higher, and may be considered as our largest breed of fine-woolled sheep.

The county of Wilts, being in great part composed of down-land, the same necessity exists there, as upon other light soils, of maintaining large flocks of hardy constitutioned sheep for the purpose of folding; to which the old stock of the country was well adapted. But the improvements in the modern system of agriculture, by the introduction of green crops instead of

* Agricultural Survey of Norfolk, by the Secretary to the Board, p. 449, and Evidence of Mr. Fison before a Committee of the House of Lords, on the British wool trade, 1828, p. 194.

fallows upon light land, having enabled the farmers to supply their flocks with better winter food than the bare pastures on which they were previously kept, the size of the present race has been increased, and the form has been improved by crossing. It is, however, said, that they have become less hardy, and worse nurses; and, in particular, so very nice in their food, that they will starve on the same kind of land where the former sort of smaller and more compact sheep lived well. Another serious consequence of the change is also said to have been produced by this delicacy of appetite—that by rejecting the feed of the downs, on which the chief dependence of the flock master rests, the herbage has gradually grown coarser; which evil has been further increased by the consequence of shortening the stock previously kept; it being a well-known fact, that the closer the downs are fed, the more sheep they will support *. But it is more probable that the greatest injury done to the downs has been occasioned by the system, pursued during the high prices of corn, of breaking them up, and, after exhausting them by repeated cropping, then laying them down with artificial grasses which soon wear out, and coarse natural grasses then take possession of the land, instead of the finer sward with which it had been previously covered.

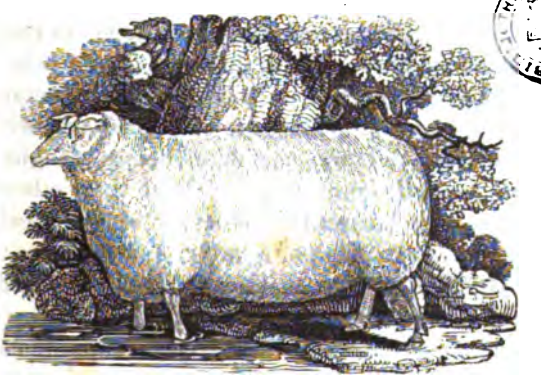
It has been also found that the quality of the wool has been injured by the new system of feeding; and in this county, as well as in Norfolk, the native breed has been nearly superseded by that of the South downs †.

V. The DORSET BREED have small horns with white faces and legs: their wool is of an intermediate kind, between long and short, and of middling fineness, weighing from three and a half to five pounds per fleece; and the carcass averaging eighteen pounds per quarter, of excellent mutton. They are a hardy race, being chiefly bred on open downs, and inured to the fold; but their principal value consists in the peculiar forwardness of the ewes, which take the ram at a much earlier period than any other species, and are therefore much sought for, and command high prices for the purpose of producing house-lamb for winter consumption ‡.

* Agricultural Survey of Wilts., p. 142.
† See Chapter IX. Book IV.
‡ See Chapter IV. Book IV.

The Dorset sheep are chiefly to be found in the county from which they take their name, and in the neighbouring borders of Devonshire; but a variety of the same breed occurs in *Dean Forest*, and on the *Mendip Hills*,—a small compact animal, that will thrive on the poorest soil and fatten on such land as will scarcely keep other sorts alive. Pasturage ever so dry and exposed will feed this kind: they are very hardy; their wool fine; and the mutton is also excellent for the table, being full of gravy and of a rich flavour *. The Mendip Breed resembles, in many points, the Merinos; and there is a tradition that the original stock of the Spanish fine woolled sheep was obtained either from those hills or from those of Cotswold, in Gloucestershire; but the breed now prevailing in the latter district bears no likeness to them.

The *Polled Sheep* may be divided into two classes—the *long*, and the *short-woolled*—the peculiar merits of which have for many years formed a subject of discussion among agriculturists. Each has valuable properties, and efforts have been made to blend them, by crosses, but hitherto without complete success: nature seems to have intended them for different soils, and the short-woolled breeds, which thrive upon the bleakest hills, degenerate when removed into rich pastures, which are alone capable of maintaining the long-woolled species.



VI. The LEICESTER sheep take the lead among the *long woolled kind*; and of these there are three nearly distinct species:—

* See the Agricultural Survey of Somersetshire, 3d edit. p. 145.

1. The *Forest sheep*, which, though now confined to the open district of Charnwood Forest, were probably the common-field stock and original breed of the county. They are mostly polled, though some have small horns; are generally white, but sometimes gray-faced, with legs of the same colour; are covered with coarse combing wool; and are altogether an inferior race.

2. The *Old Leicester*, which are probably descended either from the still more ancient stock of Charnwood, improved by better feeding, and by crosses with rams from the rich pastures of Lincolnshire; or from a large boned, coarse woolled breed, long common to the midland counties. They are large, heavy, flat-sided, strong in the bone, and somewhat coarse in the offal and pelt; but full of wool of a combing quality. They are well adapted for the rich, deep, feeding soils, upon which weight of mutton and of wool are more material objects for profit than fineness of quality; and, on such lands, the rams are commonly brought to weigh forty pounds the quarter, with a fleece of twelve to fourteen pounds.

3. The *New Leicester*, or *Dishley Breed*—portrayed above—which are an improved kind of the latter species. Their forms are handsome; colour white. Their heads are clean and small, their necks short, and their breasts full; their bodies are round, with broad, straight backs, but the bellies rather light, or tucked up; their legs and the whole bone are fine, and particularly small in proportion to their size; their pelts thin, and the wool long and fine of its kind, generally averaging seven pounds to the fleece. They are of a quiet disposition, fatten early and kindly, and are capable of being brought to a great weight, on a smaller proportion of food than other breeds of the same size, the fat wethers generally weighing (when shear-hogs) twenty-five pounds per quarter, and the ewes twenty-two pounds: the flesh is fine grained and well flavoured, but too fat to please most palates.

The final improvement of this breed is unquestionably due to the late Mr. Bakewell; but there are various opinions respecting its origin. Mr. Marshall attributes it to one Joseph Allom, of Clifton, in Leicestershire, who, from being a plough-boy, raised himself by industry to the situation of an eminent farmer, and was the first who distinguished himself, in the midland district, by the possession of a superior breed of sheep. He was known

to purchase his ewes at a distance, and it has since been ascertained that he chiefly obtained them in the Melton quarter of the county; but, in whatever manner he raised his breed, it appears certain that it was in high estimation before Mr. Bakewell's time, as it was customary for the most careful breeders to resort to Clifton for ram-lambs, for which they gave the then extraordinary price of two and three guineas each: it has, therefore, been not improperly conjectured, by Mr. Marshall, that through the means of Allom's stock, the breed had passed the first stage of improvement before Mr. Bakewell's day *.

Another author † acquaints us—upon the authority of a gentleman long resident in the county—that about the year 1747 there was a succession of bad seasons, which occasioned a great rot in the sheep upon the clay-lands, that in a short space swept away whole flocks. Some of the small farmers were ruined; but the more opulent and enterprising resorted to the high grounds near Fridaythorpe, in Yorkshire, where they purchased some small neat sheep, which, crossed with the few that remained in their own fields, produced some very useful animals; and as the numbers bred for a long time afterwards were not equal to the demand, they sent year after year to the same market. Jobbers were established, who employed themselves in purchasing sheep on the Yorkshire wolds, for the use of the Leicestershire graziers; and, it is said, that Mr. Bakewell engaged these men not to offer their sheep to public sale till he had seen them, and had taken such as suited him. From these droves, or from the flocks so bred in his own neighbourhood, and probably from a cross with the Lincolnshire, he bred his first short-legged, square framed sheep, which were so well received that he went on breeding from his own stock, or crossing with any others that he judged most likely to attain the perfection at which he aimed; by which means, and partly, as it has been thought, by a cross with the Durham sheep, he by slow degrees produced the celebrated breed since distinguished by the name of the farm on which he resided. To him, therefore, may be justly conceded the merit of having effected this valuable improvement; but he has left many able disciples, who have

* Rural Economy of the Midland counties, 2d edit. Vol. I. p. 338.

† Mr. Pitt, of Wolverhampton, Agricultural Survey of Leicestershire, p. 249.

followed closely in his steps, and even improved upon his system; and not only Leicestershire, but many of the neighbouring counties, may now boast of possessing the breed in the highest perfection.

Many good judges are, however, of opinion, that the endeavours to improve the old breed have been carried too far, and that the introduction of the Dishley stock has reduced the quantity of mutton and wool in a much greater proportion of value, than it has improved the quality. It is admitted, that much good was effected by the early crosses, and that the New Leicesters feed quicker, and come sooner to market than the old; but they are deficient in inside fat, and are said to carry their flesh more upon the loin than in the leg; which are both serious faults in the eye of the butcher. It is also alleged, that too much value has been placed on fineness of bone, and that, in attaining that object, the constitution of the animal has been sacrificed; even, in many instances, to the destruction of the generative power in the ram.

VII. The LINCOLNSHIRE BREED so nearly resemble the old Leicester, that they require but little further description. They have white faces and legs, the bones large, and the carcass coarse; the back long and hollow, with flat ribs, but good loins, and a deep belly; forward loose shoulders, a heavy head, with a large neck, and sinking dewlap; the hind quarter broad, the legs standing wide apart, and a large dock. The pelt is particularly thick, and the fleece consists of very long combing wool, of a rather coarse quality, but weighing generally from twelve to fourteen pounds on the wethers, and from eight to ten pounds on the ewes. The flesh is open-grained, and inferior to the mutton of the New Leicester, and particularly to that of the small, short-woolled breeds; it is besides subject to be yellow, which is a great defect at market, but it frequently reaches the weight of thirty-five pounds per quarter; and fat wethers generally average twenty-five *. This description, however, applies rather to the old breed of Lincoln, as well as of Leicesters, than to the sheep now commonly ranked under those denominations; for, owing to a judicious intermixture, not carried too far, of the Dishley blood, many of their imperfections have been

* Agricultural Survey of Lincolnshire, 2d Edit. p. 403.

rectified, while they still retain the valuable properties, so essential on rich soils, of great weight of fleece and carcass, and have farther acquired some of the distinguishing marks of the improved breed, in the increased cleanness of the head, straightness of the back, and general symmetry.

VIII. The TEESWATER BREED, another variety of the old long-woolled species, was formerly the stock of the northern part of the Vale of York, and of Cleveland; but it has, of late years, undergone so great a change, by crosses with Dishley rams, and their descendants, which were introduced into the north, by Messrs. Culley, about the year 1766, that the original race is now but rarely to be met with.

In their pure state, the Teeswater sheep are very large, coarse-boned, slow-feeders, and their wool is dry and harsh; but they arrive at greater weight than any other breed in the kingdom; the three year old wethers reaching to upwards of thirty pounds, and even more *, per quarter, and producing a fleece of about eleven pounds. The ewes are singularly productive of lambs, twins being not only common, but three, and even four, being sometimes produced at a birth.

A variety of this race, which formerly occupied the lower district of Northumberland, were called *Mugs*, probably, as the surveyors of that county suggest, "from their faces being covered with a muff of wool, close to their eyes" †: but they have given way to the Dishley breed, or have been so improved by crosses, as to retain but little of their original appearance.

The value of this species of stock may be in a great degree estimated by its aptitude to increase in flesh at an early age, and when no particular means of fatting are used; of which the following account of four, fed by Mr. Mason, of Chilton, affords a fair specimen:—

* A four shear sheep of this kind, bred by Mr. Thomas Hutchinson, of Sockburn, and killed at Darlington, in December, 1777, weighed 62 pounds per quarter; and another, belonging to Mr. Dinsdale, of Newsham, weighed 54 pounds. A wether, rising three years old, bred by Mr. Powley, of Thorndon-Stavard, and killed in January, 1799, weighed 59 pounds per quarter; and a lamb, five months old, bred by Mr. Henry Hutchinson, weighed 22 pounds per quarter. See Agricultural Survey of Durham, p. 248; and Agricultural Survey of Yorkshire, North Riding, p. 260.

† Agricultural Survey of Northumberland, by Messrs. J. Bailey, and G. Culley, 3d edit. p. 150.

Lambs.	Shearlings.		Two Shear.
Wt. Aug. 15, 1803.	Wt. 4 Oct. 1804.	Gain.	Gained to 15 Oct. 1805.
lbs.	lbs.	lbs.	lbs.
92	202	110	34
82	193	111	38
87	216	129	32
91	199	108	28
352	810	458	132
Average 88	202½	114½	33

Thus, the weight gained from five months to one year and seven months old, is 114½ lbs., or at the rate of 1 lb. 15 oz. per week; and from that age to two years and seven months old, the gain in weight is only 33 lbs., or 10 oz. per week *.

IX. The ROMNEY MARSH Sheep have existed immemorially on that rich tract of grazing land, on the southern coast of the counties of Kent and Sussex, from which they take their name. In their pure state, they are distinguished by white faces, a considerable thickness and length of head, and a broad forehead, with a tuft of wool upon it; a long and thin neck, and flat-sided carcass. They are wide on the loin, but have a sharp chine, and the breast is narrow, and not deep; the belly large; a good cleft; the thigh full and broad, carrying the chief weight in the hind quarter; the tail thick, long, and coarse; the legs thick, with large feet, the muscle coarse, and the bone large. The wool is a good combing quality; the fleece of fattening wethers weighing from eight to nine pounds; the mutton is equal to that of any of the large polled breeds, and their proof being good, they are favourites with the butchers. When fat, the wethers usually average from ten to twelve stone each, and the ewes from nine to eleven †. They are very hardy; are bred with little care, on wet and exposed land, requiring, after the first year, when they are wintered on the uplands, no other food in the severest situation, than occasionally a little hay, in addition to their pasture; and are fattened entirely on grass.

* Durham Agricultural Survey, p. 253.

† Price, on the Management of Sheep in Romney Marsh, 4to. Ch. II. p. 109.

Within these few years, the fashionable Leicester breed has been introduced into Romney Marsh, and the cross has, no doubt, improved the form of the native sheep; but its effect, in the opinion of a very competent judge *, "has evidently been that of reducing the size of the animals, and making the wool coarser, but giving them a better disposition to fatten." The rage for Leicester sheep seems, however, to have subsided among the marsh graziers, and the ram breeders are now anxious to make it appear, that their stock is unmixed with the Dishley blood; though, in truth, there are but few, if any, flocks without at least a remote dash of it. Besides the diminution of weight of carcass, and the deterioration of the fleece, the Leicester breed has been found too tender for the cold and open pastures of the marsh: the breeders complain that they suffer great losses from the delicacy of the lambs; and the ewes are found neither to produce so well, nor to be such good nurses as those of the original race: but the improved disposition to fatten must be allowed to be of great advantage. Mr. Price, who has been already quoted, informs us, "that, at no very distant period, the wethers seldom reached market till three years old, but now two years old wethers, and sometimes even yearlings, are sold to the butchers;" and he adds, as his opinion, "that this variety may be made the most valuable in the kingdom for rich pastures, as producing most meat at the least expense, and thus afford the grazier the greatest profit."

X. The DEVONSHIRE polled sheep form two distinct varieties of the same breed:—

1. The *South Devon*, or *dim-faced Nott*, with brown face and legs; a crooked backed, flat sided, coarsely boned and woolled animal, carrying a fleece of 10 lbs. average weight, and averaging 22 lbs. per quarter of good mutton, at thirty months old.

2. The *Bampton Nott*, with white face and legs, though in other respects nearly resembling the former in appearance; but the wethers will, at twenty months old, average as much weight of carcass as the others at thirty, and, if kept on for another year, will reach, when fat, as much as 28 lbs. per quarter: they are not, however, equally productive of wool; for, at the first period, they only yield about 6½ lbs., and at the latter, 8 lbs.

Considerable improvement has been effected in the form of

* Mr. Boys, of Betshanger. Agricultural Survey of Kent, 2d ed. p. 174.

these sheep, as well as in most other of the long-woolled breeds, by crosses with the *new* Leicesters, and a greater aptitude has been acquired to fatten at an earlier period; but while many of their defects have been thus cured, the same complaints are made, as in the other instances already noticed, of increased tenderness in the lambs, which are found to require extraordinary care and nursing, yet often perish through the severity of the weather; and of a very material diminution in the weight both of the fleece and carcass; the former being reduced from ten pounds to eight, and the latter from twenty-two pounds to nineteen pounds per quarter. They are also bare of wool upon the belly, which occasions great injury to animals constantly lying out, and much exposed to wet; none of which disadvantages have attended a cross with the old Leicester, which has, on the contrary, increased the weight of flesh, as well as the disposition to fatten *.

Another variety of long-woolled sheep is found on the *Cotswold Hills*, to which most of the remarks already made on the Devon breeds will equally apply.

The chief of the *short-woolled* polled breeds, are—

XI. The SOUTH-DOWN, of which the specific characters are,—Faces and legs gray; bones fine; head clean; neck long and small; low before; shoulder wide; light in the fore quarter; sides and chest deep; loin broad; back bone rather too high; thigh full, and twist good; wool very fine and short, (the staple being from two to three inches in length,) weighing an average of two pounds and a half per fleece, when killed at two years

* Vancouver, Agricultural Survey of Devonshire, Chap. XIV. Sect. 2.

old. Flesh fine grained, and of excellent flavour; quick feeders: constitution hardy and vigorous. They are round in the general appearance of the barrel; and, from standing wide on their hind legs, and being shut well in the twist, the leg of down mutton is remarkably round and short, not only cutting handsomely for the table, but weighing heavier than common in proportion to the fore quarter; which are material advantages to the butcher, as they command a ready sale, at an advance of a penny per pound over the other joints. Fat wethers usually average about eighteen pounds per quarter; but this has been, in many instances, increased by late attempts to improve the size of the carcass. Whether these have been judicious, time alone can determine; but it does appear from the evidence of some of the persons examined before a select committee of the House of Lords, appointed in 1828, to take into consideration the state of the British wool trade, that they have injured the quality of the fleece *. This has, indeed, been denied by the breeders; but in all other instances, it has been uniformly found that efforts to increase the flesh have been attended with similar effects. In the present state of the wool trade, this may, however, be of less consequence than it might have been some years ago, for it appears from all the concurrent evidence produced before that committee, that the British carding, or short clothing wools, have been entirely superseded in our manufactories, by the German and other foreign kinds †. But too great an increase of carcass may also injure the quality of the mutton, which is now of the very finest kind.

These sheep have been bred for ages past on the chalky soils of the South downs, in Sussex; and on such short pasture, and in such exposed situations, they are perhaps the most valuable breed in the kingdom; but they are spreading fast not only into similar districts, but into counties better calculated for long-woolled and larger sheep. That the breed will, on those rich

* See the Evidence in the Printed Report, of Mr. C. Bull, of Lewes, Wool-stapler; Mr. Sutcliffe, of Huddersfield, ditto; Mr. Brooke of Honley, near Huddersfield, Cloth manufacturer; Mr. G. Goodman, of Leeds, Wool-factor; and of Mr. Sheppard, of London, Blackwell-Hall factor, Chairman of the London Committee of the Woollen Trade.

† See Chap. X. Book IV.

soils, degenerate in the superior properties of their flesh and wool, there can be little doubt; but it will still be matter of calculation, whether that disadvantage may not be more than balanced by superior weight. On their native downs, it will probably be found better to preserve them as near to their original size as possible; for, if too large for the constitution of the soil, it will be difficult, if not impossible, to maintain the increase of weight; or, if maintained, it probably will be with some loss either of the hardiness or activity requisite to their thriving on the land for which they are most appropriate; and thus an apparent present advantage may lead to serious future loss. The figure above delineated, is from a South-down ewe, bred by Mr. Ellman, of Glynde.

XII. The CANNOCK HEATH sheep are bred upon an extensive waste, so named, in Staffordshire; they are very generally grey faced; without horns; bear fine wool; and from many points of similitude between them and the South-down breed, it has been thought that they were originally derived from the same stock. The bone, however, is coarser; nor do they possess the same beauty and compactness as the downs; but these defects probably arise from inattention on the part of the former breeders, which the present flock-masters are making efforts to rectify; and, to counterbalance them, the carcass is heavier, and the mutton equally good.

XIII. The RYELAND BREED is so called from a district in the neighbourhood of Ross, in Herefordshire. They are small, white faced, and hornless; the wool growing close to their eyes; are light in the bone; have small, clean legs; and, when proper attention has been paid to the breeding stock, possess great compactness and symmetry. The ewes weigh from nine to twelve and fourteen pounds, and the wethers from twelve to sixteen pounds per quarter, when fatted, at three to four years old, and their flesh is equal to any mutton in the kingdom. The fleece does not average more than two pounds; but the quality of the wool is unrivalled by that of any of our native stock. They are patient of hunger, and no breed is supposed capable of subsisting on a smaller quantity of food; they are, therefore, adapted to the pasturage of down land; but they require a fine herbage, and are so tender as to require shelter in the winter; and particularly at the time of lambing. They are not, as many

persons imagine, wholly a mountain breed, being kept in the vale lands as well as on the hills, and are often fatted on the same soil with the Hereford oxen.

A cross has been made between this breed and the Spanish sheep, the produce of which are termed *Merino Ryelands*, and the wool *Anglo merino*. The first stage of the cross materially detracts from the beauty of the Ryeland's form; but the fleece is much improved both in weight and quality, and the carcass is increased, while the flavour of the mutton remains uninjured. It has been affirmed, that the characteristic properties of the merino Ryelands correspond with those of the Spanish race as far as the fourth generation, and that the wool is nearly of equal quality to that of the pure merino. Great exertions were made by the late Dr. Parry, of Bath, and other spirited wool-growers to introduce them to general notice; but it appears, from the evidence produced before the Committee of the House of Lords, already mentioned, that this new breed has declined; and that, either from the general depreciation in the value of short wool, or, as some allege, from deterioration of the quality of this species, the anglo wool is now nearly unsaleable, though it still commands a higher price, when sold, than the finest pure British *.

Another cross has also been attempted between the pure Ryeland and the new Leicester breeds; but although the weight of the carcass has been thereby much increased, yet it can only be supported on land of a much richer kind than that on which the native sheep are usually fed, and it is probable, that if persevered in, on such soils, it would materially injure the mutton, while its immediate effect was certainly detrimental to the wool †.

In some of the neighbouring counties to Herefordshire, both in England and Wales, there is a breed of sheep very much resembling the Ryelands, known as the *Shropshire morf*. They bear wool of a fine quality; generally have white faces and legs, though sometimes a little freckled; are light in the bone, and have small clean limbs. There are two species, which, from inattention to the breeds, are often blended. The one polled, the other having small, light, crooked horns—a still

* See the Evidence of Mr. Cunnington, of Upavon, Wilts, Woolstapler; Mr. W. Ireland, of London, and Chalford, in Gloucestershire, Manufacturer; and of Mr. G. Webb Hall, of Sneed Park, Gloucestershire, Farmer.

† Agricultural Survey of Herefordshire, p. 121.

smaller variety, bred on the mountains, and in high estimation for the table; but which is generally known under the common denomination of *Welch*.

XIV. The CHEVIOT SHEEP were originally bred upon the hilly districts in the north-west part of Northumberland, but have since spread over many of the mountainous tracts in the neighbouring counties, and have even nearly superseded the horned breed of black-faced sheep in some parts of the Highlands of Scotland *. They are hornless, and their faces and legs are in general white, though formerly the prevailing colour was black. The best breeds have an open countenance, with lively prominent eyes; long bodies, but wanting depth in the breast, and on the chine; and fine, clean, small-boned limbs. They are seldom slaughtered until they have attained the age of four to four and a half years, when the fat wethers will average from 12lbs. to 18lbs. per quarter, fattening kindly, and producing mutton of excellent quality. The wool is inferior to that of most other of the short-woolled polled breeds, and appears to have been injured by some late attempts to improve the carcass †. It is, also, further deteriorated by the practice of smearing—or *salving*, as it is termed—the flocks pastured on the most elevated hills, with a mixture of butter and tar, in order to protect them against the inclemency of winter: this custom, however, is now nearly disused in the Lowlands, though in many places it is yet thought advantageous to the fleece ‡.

The sheep known as the *Herdwick breed*, though smaller than the Cheviot, and only found in one rocky and mountainous district at the head of the Duddon and Esk rivers, in Cumberland, appear to be only a variety of the same race. The wethers and ewes are all polled: their faces and legs are speckled; but a great portion of white with a few black spots are accounted marks of the purest breed; of which also are the hornless tups; for when these are found with horns, they are considered as descended from a cross with the common black-faced heath species, and their wool is then generally intermixed with *kemps*, or hairs.

* See the Evidence of the Right Hon. Lord Napier, before the Committee of the House of Lords, on the Wool Trade, 1828. Minutes, p. 15.

† See the Evidence of Mr. Sutcliffe, Minutes, p. 185.

‡ 12lbs. of butter mixed with 4lbs. of tar, are used for the salving of twenty-four sheep: the expense about sixpence each.

They are a hardy breed, well adapted to seek their food amongst the rocks which they inhabit; which are in many places bare, and, where covered, the soil is thin, but the herbage mostly green, though heath is found on the summits. They have no hay in winter, but support themselves in the deepest snows by scratching down to the herbage, and should any part be blown bare, they are sure to discover it. In storms they gather together, and keep stirring about, by which means they tread down the snow, keep above it, and are rarely overblown. The lambs are protected by nature, being well covered with wool when they are dropped.

The ewes are kept as long as they will breed, which is often until ten, and even fifteen years of age: the wethers go off at the same age as the Cheviots. Both ewes and wethers are sold from the mountains, and killed without being put on any better pasture, yet are sufficiently fat, and the wethers will weigh about 10lbs. to 12lbs. a quarter: the ewes from 6lbs. to 8lbs. From being fed on heath and mountain plants, the flesh acquires a peculiarly fine flavour, when these are in blossom, from July till September, and is then esteemed a great delicacy; but, when out of season, the mutton is dry and indifferent.

The mountains on which these sheep are bred are the property of Lord Muncaster, who is also proprietor of the flocks that depasture them; and having, from time immemorial, been farmed out together to herds, it is thought that, from this circumstance, the farms have obtained the name of *Herdwicks*, or the district of the herds; from which the sheep have also received their title. They are chiefly in the hands of one family, of the name of Tyson, which is said to have been settled in that sequestered spot above four hundred years*.

Another variety, termed the *Dun-faced breed*, is found in the exposed northern districts of this island. The faces of the sheep are of a dun, or tawny colour: the animals are smaller in size; have short tails; and are not so hardy as the preceding sort. The wool is variously streaked with black, red, brown, or dun, and partly of a fine texture, weighing about a pound and a half per fleece, when killed at four years and a half. Flesh finely grained, and of excellent flavour.

The *Shetland breed*, a nearly similar race, derives its name

* Agricultural Survey of Cumberland, Chap. XIII. Sect. 11.

from the islands on the north coast of Scotland, where these sheep are reared. The wool is very fine and soft, fit for the finest manufactures; the fleece weighs upon an average from one to three pounds. The Shetland sheep are very hardy, but too wild to be confined. There are two varieties of this breed; the *first* of which has very coarse wool above, and fine wool below, being supplied with long hairs termed *fore* and *scudda*, which protect the animals from the intense cold of winter; the *second* variety has soft, cottony fleeces, and is less hardy than the preceding variety, the wool being short and open: the weight of the wether carcass of either does not average more than 8lbs. per quarter.

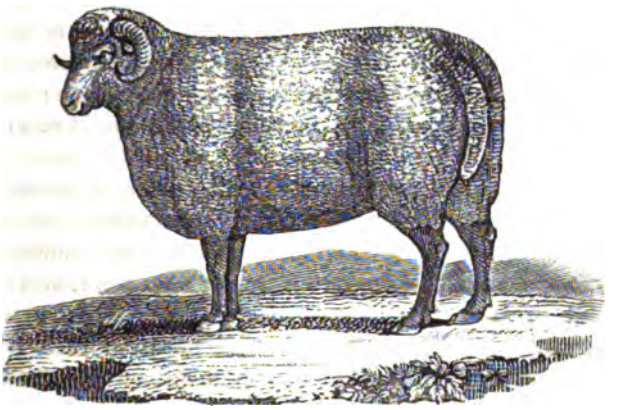
The *Isle of Man* possesses a breed of apparently the same parentage, but partly horned as well as polled: their general colour is white, but many are gray, and a few of a peculiar brown colour, provincially termed *Laughton*. In the whole breed one distinctive mark is said to appear in a Laughton-coloured patch on the back of the neck; and it is somewhat singular that a similar mark has been observed on sheep from the island of Iceland, which are, indeed, said to bear a general resemblance to the Manks breed. It is observed, that sheep of the Laughton colour are more tender and slower feeders than the others; but their wool is peculiarly soft, and is held in high estimation for the manufacture of stockings. The mutton of each sort is excellent; but in other respects the breed is little deserving of attention. They are of mean appearance, with high backs and narrow ribs; slow feeders, and long in coming to maturity. Many attempts have been made to improve them by crosses with Leicester, Southdown, pure Merino, and Ryeland Merino rams. These have in some degree succeeded, and in particular the cross between the Southdown and the Manks is said to be little inferior to the male parent; that with the Ryeland Merino having been judiciously made with some of the finest woolled ewes, has greatly improved the fleece; but it is admitted that these half-bred Manks Merinos are not good feeders*.

* Agricultural Survey of the Isle of Man, Chap. XIV. Sect. 11.

CHAPTER II.

ON THE MERINO, OR SPANISH SHEEP.

THE sheep of this foreign species—a wether of which breed is here delineated—have horns of a middle size, of which the ewes are sometimes destitute; faces white; legs of the same hue, and rather long; shape not very perfect, having a piece of loose skin depending from the neck; bone fine; pelt fine and clear*.



The wool of the Merino sheep is uncommonly fine, and weighs, upon an average, about three pounds and a half per fleece. The best Merino fleeces have a dark brown tinge on their surface, almost amounting to black, which is formed by dust adhering to the greasy, yolky properties of its pile; and there is a surprising contrast between it and the rich, white colour within, as well as the rosy hue of the skin, which peculiarly denotes high proof. The Merinos are natives of the northern provinces of Spain, and were first introduced into this country in the year 1787; but it was not until 1792 that any effectual

* Facts and Observations on British Wool. 4to. 1799. pp. 4, 5. Minutes of Evidence before the Lords' Committee on the Wool Trade, in 1828. pp. 69. 234.

measures were adopted towards improving our native breeds by a Spanish cross. In the last-mentioned year his late Majesty received several rams of the Negretti breed; but so great was the force of prejudice, that notwithstanding the manufacturers confessed the wool of the Anglo-Spanish cross to be of prime quality, yet not one individual bid for it a price at all equal to what they paid for good Spanish wool. From these sheep imported by his Majesty, and from the great exertions of the late Lord Somerville, (who at an immense expense imported a flock of choice Merinos,) great benefit has been derived to the wool, by crossing this sort with the best British breeds; although the produce of the cross has not been improved in shape. The most successful cross has been with the Herefordshire, the fleece of which is heavier, in proportion to the carcass, than that of any other known breed in Europe; the average weight of the fleeces of two-shear ewes being estimated at four pounds and a half avoirdupois, in an unwashed state; and the fleece of a fat wether of the same age will be from five to seven pounds.

From the high prices which Anglo-Merino wool commanded during the late war, great expectations were formed of the advantages to be obtained from the introduction of Spanish sheep, which were accordingly imported to a great extent, and sold at very high prices*. Of some of the crosses with that breed, we have already seen the result: its effect has also been tried in Sussex, upon the South-down sheep, by Lord Sheffield, and other eminent breeders, and the wool of the flocks was thereby considerably improved; but it was accompanied by some capital defects, not to be compensated by any improvement of the fleece—tender constitution, slow feeding, bad shape, and deficiency in the number of lambs. This new breed has therefore

* At the sale of his late Majesty's sheep, at Kew, in 1809, Rams, of the Negretti and Paular race—two of the most esteemed breeds in Spain—sold from 25 gs. to 75 gs. each; and Ewes, from 14 gs. to 55 gs.: all the latter, and many of the former, being full-mouthed. The entire sale averaged, as follows:—

40 Rams	1869 gs.	Average	46½
60 Ewes	1958 gs.		32½
100	3827 gs.	Total Average	£40 3 7

been generally given up in Sussex *, and also in Wiltshire, where it had been extensively tried †. There are still, however, many large flocks of pure Merinos, the proprietors of which affirm that their qualities are not only uninjured, but have even been improved by their naturalisation in this country. So far as regards the carcass, this may be true; but some of the evidence before the late Committee of the House of Lords goes to prove, that the wool has become more harsh; a statement, it may be observed, which is corroborated by the difficulty in selling it, and rendered probable by the difference of climate and of treatment to which the animal has been exposed ‡; though at the same time it is admitted, that the weight of the fleece has been increased, and that the price is double that of South-down §: the flesh is also fine; but, notwithstanding the improvement of the carcass, the return in mutton is still deficient ||.

In Spain, the sheep from which these flocks have been obtained, are bred in the northern provinces of the kingdom of Leon, and of Segovia and Soria, in Old Castile, and the district of Buitrago, in New Castile; from whence, after being shorn, they are driven southward at the approach of winter, and remain dispersed over the plains of Estremadura, La Mancha, and Andalusia, until the return of summer, when they travel back to their native pastures; and whether from instinct or habit, they are said to display symptoms of restlessness as the time approaches for their change of pasture. They are, in consequence, termed *Trashumante* flocks; and there is a code of regulations, sanctioned by the authority of law, for the government of the shepherds during these periodical migrations. The ancient pasturages in the south are secured to them at a fixed rate. A strip of land, of considerable width, is left in pasture at each side of the road for their accommodation, without which they could not travel with convenience; and the

* Agricultural Survey of Sussex, p. 310, and Evidence of Mr. Ellman before the Committee of the House of Lords, on the Wool Trade, 1828.

† Evidence of Mr. Cunnington, ditto, p. 193.

‡ Evidence of Mr. Sheppard, Chairman of the London Committee on the Wool Trade, ditto, ditto.

§ Evidence of Mr. Hubbard, of Leeds, ditto, ditto; and of Mr. Varley, of Leeds, ditto, ditto.

|| Evidence of Mr. Webb Hall, of Sneed Park, Gloucestershire, ditto, ditto.

greatest attention is paid to secure these privileges. By thus removing them at the different seasons from north to south, and back again, they are kept in a nearly equal temperature, and it probably is to that advantage that the superiority of the wool of the Trashumante flocks is to be attributed; that from those which remain stationary, being far inferior; as a proof of which, the *Caceres*, or Estremaduran wool, grown in one of the central provinces, commands little more than half the price of the *Leonesa*. It must, however, be admitted that, in Spain, it is a disputed point whether the travelling flocks are really benefited by the equality of climate thus obtained; some stationary flocks in the province of Segovia being said to produce as fine wool as any of the Trashumante.

If the supposition that the change of pasture be correct, it must follow that these sheep, when exposed to the variable climate of this country, will necessarily change the quality of their fleece; upon which, climate is known to have the greatest influence. It may, indeed, be said, that the change might even then be advantageous; for a certain degree of cold is rather favourable than otherwise to the growth of fine wool; and its improvement in Saxony, into which country the Spanish breeds were introduced about half a century ago, might be adduced as an instance in point. But in Germany, these sheep are regularly housed during the winter; they are also kept, during that season, on dry fodder, which may be supposed to have a material effect on the fleece, for the Spanish sheep are kept on bare, and generally burnt-up, pasture, without even tasting artificial food; and our own finest woolled flocks are maintained on the scanty herbage of the downs.

In France,—where the royal flock of Rambouillet, picked from the best in Spain, was introduced in 1785,—the sheep suffered greatly by the cold until housed; and although the Merino breed has been since naturalized in that country*, and still retains the fineness of the texture of the wool, yet it loses in softness and in strength of staple.

The Trashumante flocks have existed from a very early period in Spain. There is an ancient tradition that the original

* By a treaty made between France and Spain, during the French Revolution, 5000 ewes and 500 rams, of the best Spanish breeds, were placed at the disposal of the French Government.

stock was obtained from this country; but it has not been traced to any authentic source. In the sixteenth century they were calculated at seven millions; but their numbers have since much diminished, and they are now supposed not to exceed five.

The chief flocks are those of *Paular*, which belong to a richly endowed monastery of that name in Segovia;—of *Negretti*, the property of the Marquess of Campo d'Alange;—of the *Escurial*, formerly belonging to the crown; and those owned by the Duke de l'Infantado, the Marquesses d'Iranda and Péralès, and Count San Rafael; each of which consist of from 40,000 to 60,000, and the average weight of the fleece is estimated at 5lbs.*

The total export of Spain formerly amounted to about 32,000 bags, of 250lbs. each; but this is daily diminishing, in consequence of the rapid increase of the German fine wools, and of the great depreciation of prices in this country. But little is consumed in the manufactures of Spain, especially since the revolution, which put a stop to the great royal manufactory of Guadalaxara. An attempt was, indeed, recently made to re-establish those magnificent works, through the medium of a public company formed in London; but, like most of such projects, it failed. It is, however, not improbable that the present extremely low prices of wool, in Spain, will induce the Spaniards to manufacture for themselves: if not, the Trashumante flocks will decrease, for the fleece being the sole object of that system, it will be no longer worth pursuing, if the wool should continue, as at present, a mere drug in their markets; and it has, besides, been long considered as prejudicial to the real interests of the kingdom, by its retaining immense tracts of land in the southern provinces in comparatively unprofitable pasture.

* Bourgoing: *Tableau de l'Espagne Moderne*, *Vol. I. Ch. III.*

SYNOPSIS

OF THE

DIFFERENT BREEDS OF SHEEP IN GREAT BRITAIN.

				Average weight of fleece, per lb.	Average weight of wethers, per quarter.	Years old when killed.
					lbs.	
Heath	large horns	black faces and legs	coarse long wool	3½	14	4½
Exmoor	horned	white faces and legs	long wool	4½	15	2½
Norfolk	large horns	black faces and legs	fine short wool	3½	18	3½
Wiltshire	horned	white faces and legs	short and moderately fine wool	2½	20	3
Dorsetshire	small horns	ditto	fine short wool	3½	18	3½
Dishley	polled	ditto	long wool	6	22	2
Lincolnshire	ditto	ditto	ditto	9½	25	3
Romney Marsh	ditto	ditto	ditto, good quality	7	24	2½
Tees Water	ditto	ditto	long wool	9	28	2
Dartmoor Natts	ditto	ditto	ditto	8	22	2½
South-down	ditto	gray faces and legs	very fine short wool	3	18	2
Cannock Heath	ditto	gray faced	short fine wool	3	20	3
Herefordshire	ditto	white faces and legs	very fine short wool	2½	14	4½
Shropshire Morf	polled and horned	speckled faces and legs	short fine wool	2	15	4½
Herdwick	polled	ditto	short wool	2	10	4½
Cheviot	ditto	white faces and legs	fine short wool	3	16	4½
Dunfaced	ditto	dun faces and legs	ditto	1½	7	4½
Shetland	ditto	colours various	fine cottony wool	1½	8	4½
Pure Merino	horned	white faces and legs	short and very fine wool	3	10	6
Half Merino	partake of the various description of the crossed breed		ditto	4½	—	—

CHAPTER III.

ON THE BREEDING AND MANAGEMENT OF SHEEP.

BEFORE we proceed to discuss this branch of rural economy, it will be necessary to state the names or terms by which these animals are known at different ages, and in various counties.

From the time of weaning to the first shearing, the *males* are denominated *hogs*, *hoggets*, or *hoggerels*, after which they receive the appellation of *shearing*, *shearling*, *shear-hog* or *diamond tups*, or rams; after that they are called *two*, *three*, or *four shear*, according to the number of times they have been shorn.

When male sheep have been castrated, they are termed, from the period of weaning to that of shearing, *wether* or *wedder hogs*, then *shearings*, *shearlings*, &c.; after they have been shorn a second time, they are denominated *young wethers*, or *two-shear wethers*, then *three*, *four*, or *five shear wethers*, according to the number of clippings or shearings they have undergone.

The females have the appellations respectively following:—from the time of weaning to the first shearing they are termed *ewe* or *gimmer hogs*; they then take the name of *gimmers* or *theaves*, which continues only for one year, after which they are invariably denominated *two*, *three*, or *four shear ewes*; and, when old, they are termed *crones*.

Sheep, in general, renew their first two teeth from fourteen to sixteen months old, and afterwards every year, about the same time, until they are turned three years old, or rather *three shear*, to speak technically, when they become full-mouthed; for, though they have eight teeth in the under jaw before, it is believed they only cast or renew the six inside ones. But, with regard to this point, there is a difference of opinion among experienced shepherds, some of whom conceive that they cast only six, while others think they renew the whole eight fore-teeth.

With respect to the selection of sheep, as an article of *live stock*, the same principle of symmetry of form, and other re-

quisites to the formation of a good breed of black cattle, which have been already specified, are equally applicable. The breeder, or grazier, should also carefully examine the nature of his land; and having attentively weighed its relative degrees of fertility, and his various sources for supplying food, he may then proceed to purchase that breed, which, after mature consideration, he has reason to believe is best calculated for him. In this point, the introductory view of breeds and varieties, already referred to, will probably afford some guide; but there are some additional hints, to which we would call his attention. In the first place, therefore, he should take care not to suffer himself to be led into needless expense, in purchasing fashionable breeds, by which his affairs might become involved, and his exertions in other objects be rendered nugatory. Secondly, the difference of the land, whence the sheep are to be purchased, ought to be attentively weighed; for with sheep, as with cattle stock, if any breed be brought from a rich to an inferior soil, it must necessarily decrease in value and condition. Not only, therefore, must sheep be suited to the pasture, but they should also be purchased, if possible, from poorer land than that of the intended proprietor, for on attention to this last point depends their immediate thriving.

Having thus noticed the general objects in selecting sheep, we now proceed to state some particular points that will demand the breeder's attention; and, as in all cattle the male has the greatest influence, we shall specify those requisites which are essential to a good *ram*.

"His head should be fine and small; his nostrils wide and expanded; his eyes prominent, and rather bold and daring; ears thin; his collar full from his breast and shoulders, but tapering gradually all the way to where the neck and head join, which should be very fine and graceful, being perfectly free from any coarse leather hanging down; the shoulders broad and full, which must at the same time join so easy to the collar forward, and chine backward, as to leave not the least hollow in either place; the mutton upon his arm, or fore-thigh, must come quite to the knee; his legs upright, with a clean, fine bone, being equally clear from superfluous skin, and coarse hairy wool, from the knee and hough downwards; the breast broad and well forward, which will keep his fore-legs at a proper wideness; his girth, or chest, full and deep, and, instead of a hollow

behind the shoulders, that part, by some called the fore-flank, should be quite full; the back and loins broad, flat, and straight, from which the ribs must rise with a fine circular arch; his belly straight; the quarters long and full, with the mutton quite down to the hough, which should neither stand in nor out; his *twist* (i. e. the junction of the inside of the thighs) deep, wide, and full, which with the broad breast, will keep his four legs open and upright; the whole body covered with a thin pelt; and that with fine, bright, soft wool." *

Such is the description of the animal recommended by Mr. Culley, who observes, that the nearer any breed of sheep comes up to it, the nearer they approach towards excellence of form; and there is little doubt, but if the same attention and pains were taken to improve any particular kind, which have been bestowed on the Dishley breed, the same beneficial consequences would be obtained.

In addition to the symmetry and other requisites above specified, it may be remarked, that as the quality of the wool depends greatly upon the breeder's judgment, the young grazier will find it beneficial to his interest to consult some experienced wool-stapler, or clothier, who, from his occupation, being accustomed to examine wool, is consequently enabled to determine, not only with accuracy, but also with a view to the breeder's real profit. Further, the pelt, or coat, should be attentively investigated, lest it be *stitchy haired*, in which case the wool will be so materially damaged, in the course of two years, that the injury cannot be remedied for a long period, unless the whole flock be changed. But the fineness of wool is not the only criterion by which it should be judged even in the short-woolled breeds: the staple is also of the greatest importance; and on that material point—on which the substance and wear of the cloth so much depends—it may be observed that the, now fashionable, Saxon wool is far inferior to the fine Spanish growths of Leonesa and Segovia.

With respect to the *time*, or proper age, for purchasing sheep intended for breeding, there is a difference of opinion: but the most experienced breeders recommend them to be procured, a short time previously to shearing, from the farmer, grazier, or owner's house; because they will then be seen in

* Culley on Live Stock, pp. 103, 104.

their natural state, and the real depth of the staple may also be easily ascertained without the possibility of any fraud or imposition being practised on the buyer by the vender.

Ewes generally breed at the age of fifteen or eighteen months, though many experienced breeders never admit the ram till they are two years old. Much, however, depends, in this respect, on the goodness of the food, as well as on the forward or backward state of the breed. The choice of ewes, therefore, ought to be made with care and discrimination, not only as to the characteristic marks, which ought to be the same as those of the ram, but also with regard to the breed; for, with sheep, as with other cattle stock, no certain degree of excellence can be attained, *unless the female possesses an equal degree of blood with the male.* In particular, a purchaser should see that the animals be *sound;* and, in order to ascertain this point, it will be advisable to examine whether the teeth are white, the gums red, the breath not fetid, the eyes lively, the wool firm, and the feet cool; qualities these which afford a certain criterion of health or disease.

Of equal importance is the proper selection of *rams*, even of the same breed and apparent qualifications: in attending to which point, the conduct of the late Duke of Bedford (whose memory every real friend to his country must revere) deserves to be imitated by all attentive breeders. Previously to drawing off the ewes for tupping, it was his constant practice to select every ram, together with the lambs begotten by it in the preceding year, from the rest of the flock, and confine them in separate pens, in order that he might examine them and their issue, by the value of which he was guided in his determination.

Ewes bring forth one, two, and sometimes three lambs *, after

* The most prolific sort is the *Teeswater* variety of the Lincolnshire breed, of which Mr. Culley has given the following instances. An ewe belonging to a Mr. Eddison, when two years old,

In 1772, brought him four lambs,
In 1773, ... five lambs,
In 1774, ... two lambs,
In 1775, ... five lambs,
In 1776, ... two lambs,
In 1777, ... two lambs;

and of these the first *nine* lambs were yeaned in *eleven* months. But such instances are of very rare occurrence, and deserve notice rather as being

a gestation of five months, or twenty weeks; hence the sheep-farmer, or breeder, may, in general, by considering whether he has sufficient grass to support the ewes and their progeny in the spring, ascertain the most advantageous period for lambing; or, in the event of a failure of pasturage, whether he has a stock of turnips adequate to their maintenance till there is a sufficient herbage to supply them with food.

The usual time of yeaning is towards the end of March, or early in April; consequently the rams are, according to the general practice, admitted in the commencement of October. But in the county of Dorset, where the ewes are, from a peculiarity in their constitution, capable of bringing lambs at a much earlier period*; and also in the southern and south-western districts, where large quantities of house-lamb are raised for the table, it is more profitable to deviate from this plan, and so to admit the ram, that the lambs shall be dropped from four to six weeks, or more, earlier.

The strength and beauty of sheep stock also greatly depend on the number of rams allowed to serve the females. While the former are young, fifty or sixty should be the utmost extent; and, as they advance in years, the number may be gradually increased; without these precautions, the lambs would not only be deficient in number, but also in point of strength.

Various expedients have been resorted to, in order to make the ewes *blossom*; among others, is the practice of worrying them with small dogs, kept for that purpose, in consequence of which they become *warmed*, so that they seldom refuse the ram. In Leicestershire, a practice has been introduced, at Dishley, of employing *teasers*; that is, inferior rams, with a

curious deviations from the usual course of nature, than as affording any real ground for calculation.

According to M. Teissier's experiments on gestation, (already alluded to in the previous books,) out of 912 ewes,

140	lambed between the	146th and 150th day;	mean term 148
676	....	150th and 154th day;	 152
96	....	154th and 161st day;	.... 157½

The extreme interval being 15 days to a mean duration of 152.

* It is commonly, but erroneously, supposed that the Dorset ewes bring forth lambs twice a year; such instances have occurred, but they are rare.

cloth so fitted on them, as to prevent copulation; and whose duty it is to prepare the ewes for the visits of the sultan of the fold. But it is much better, and certainly a more rational plan, to keep the rams and ewes in different pastures, till the time when they are intended to be brought to the rut; and for about five or six weeks before, let them have somewhat better pasture than they are usually accustomed to, by which expedient they will be disposed to take the ram the sooner. In fact, it is with sheep as with other cattle, the female must be in a certain state desirous of the embraces of the male before the latter will attempt to serve her; and this object can only be artificially attained by increasing the richness of their food a short time before they are required to couple; for, in proportion to the excellence or poverty of their food, the bodily vigour of these animals must evidently increase or diminish.

During the period of gestation, ewes require great attention, lest any accident should occasion them to *slip* their lambs; and, if that should take place, it will be proper to separate them instantly from the rest of the flock. It will, therefore, be necessary to keep them in the same manner as cows, while going with calf, namely, upon a moderate, or tolerably good sheltered pasture, where no object can disturb them; though, if this should fail, it will be advisable to give them turnips, or similar green food, under the like precautions, till within the last two or three weeks before their yeaning. In the breeding of cattle, indeed, it is a maxim which ought to be steadily kept in mind, that nothing can be more prejudicial to the females than to fatten them during gestation; and with respect to ewes in particular, this rule should be more carefully observed than with regard to any other animal; for if they be fed too high while they are going with lamb, they will undergo great difficulty and pain in yeaning; whereas, unless they are put into a little heart before that period arrives, they will not only be deficient in strength at the critical moment, but also be destitute of a sufficient supply of milk for the support of the lamb, and consequently both the dam and her progeny must be greatly weakened, if they do not actually perish from such mismanagement.

As the time of yeaning approaches, the attention and assiduity of the shepherd ought proportionably to increase, as it sometimes becomes necessary to assist nature in cases of diffi-

cult parturition; and also, if in the open air, to drive away crows and similar birds of prey, which might otherwise assault the newly dropped lambs, and pick out their eyes, notwithstanding all the efforts of the dam.

As soon, therefore, as the ewes are expected to begin to yean, they ought, every night, to be folded in a standing littered fold, on one side of which should be a warm cottage-hut, provided with a chimney, and with a stove for warming milk, and also with a bed on which the shepherd may lie down. Here he is to sleep during the lambing season, that he may be ready to watch, assist, and tend any ewes which he observes to be very near lambing, and, if necessary, to give aid to the young animal. Mr. Young, to whom we are indebted for this hint, remarks, that some considerable Norfolk farmers have such huts on four wheels, to draw about with the flock wherever they may be; but he justly conceives, that it is a far preferable method to have one littered, and well-sheltered, standing fold, on a farm of a moderate size, and two or three conveniently placed on a large one, to which the flock may be taken without any distant driving.

Further, after the lamb is yeaned, it will be necessary to examine, as early as possible, whether it be as strong as from concurrent circumstances there may be reason to expect; for, in the contrary case, it should be housed with the dam. And, if the ewe also be weak, she should be kept on good grass pasture (as turnips, however useful in other instances, would in this case tend to make them *mortify**) till she has a proper supply of milk for her lamb, which should, in the mean time, suck another ewe.

As the feeding and fattening of sheep will form a subsequent article of discussion, and the rearing of *house-lambs* will be noticed in the next chapter, we shall at present only state a few hints connected with this part of our subject prior to the lamb's being weaned.

It has already been intimated, that turnips are of great service in giving a flush of milk to ewes, which are not weakened by difficult parturition; and, as many drop their lambs at a very early period in the year, great care is necessary in supplying them with those useful roots, so as to insure a sufficient quan-

* Marshall's "Rural Economy of Norfolk," Vol. II. p. 137.

tity. If the land be liable to be poached by the sheep, the best mode is to draw the turnips, and cart them to a dry pasture, where the sheep may be baited with them once or twice in the day; proper attention being bestowed that the animals eat the whole, without committing any waste; a circumstance which, if duly observed, will afford a certain criterion of the quantity necessary for each meal, or bait, while the stock of roots will be consumed in the most beneficial and economical manner. On dry lands, indeed, a different practice may, with advantage, be adopted, by eating the crop on the land, hurdling off a certain quantity for the flock; and, as they consume these pretty clean, by extending the hurdles farther. By this method, no inconsiderable degree of trouble is saved; and, on whatever land these roots are given, provided the soil be dry, great benefit will uniformly result from such practice.

During very wet or stormy weather, or in deep snows, it will be necessary to bait the ewes and their young progeny on hay. With some farmers it is usual to drive them to hay-stacks, where they meet both with shelter and with food; a measure which is by no means consistent with the economy that ought to exist in every department of farming business. By others, again, the hay is given in moveable racks, and a stated portion *per day* is allowed: it is, indeed, an excellent method, while on turnips, let the weather be good or bad; for it corrects the watery quality of the food; and sheep thus fed are found to thrive better than upon either hay or turnips alone. In some parts of the kingdom, the most experienced farmers give their ewes and lambs bran and oats, or oil-cakes, in troughs, while these animals are feeding on turnips; but the expense attendant on this practice can only be repaid by a superior breed.

By the course of feeding here detailed, the sheep may be successfully supported till the month of March, after which time no intelligent breeder will allow any turnips to be seen on the ground. In fact, by the period last mentioned, the stock of turnips is generally consumed; so that every attention should be paid to have a proper supply of spring food. Among the many expedients resorted to for this purpose, may be mentioned the turning of sheep into a spot of rye sown for the purpose, or into crops of wheat, in order to feed them off; a practice which, however, can but seldom be adopted on farms that are appropriated *solely* to the rearing and grazing of cattle. Other re-

sources are the letting the animals run over the clover and pasture of the farm; hence the crops of hay, and pastures for large cattle, receive material injury. Further: others, with a view to avoid these extravagant practices, keep the turnips so that their shoots may become an object of sheep-food; and also have an adequate spot of land, under ray grass and clover, ready to take the ewes and lambs from turnips, before they are turned in upon the pastures. But, notwithstanding the various advantages which the last mentioned expedient undoubtedly possesses over the former modes, as the roots become sticky and hard after the tops have sprouted, and, (to omit many other inconveniences,) as it requires a great extent of ground to keep 100 lambs and ewes in this manner, *turnip cabbages*, the *ruta baga, green borecole*, (which, being impenetrable to frost, will shoot during the winter, and may be fed off several times,) and especially *burnet;* all afford singularly useful crops for spring feed. Of the vegetable last noticed, Mr. Young says, one acre, properly managed, will at this season yield considerably more food than an acre of clover and rye-grass. It possesses the peculiar property of maintaining its verdure throughout the winter; so that, under deep snows, some luxuriance of vegetation may be discovered. In November, it should be four or five inches high; and, by February, the crop will gain two or three inches in growth in the young leaves, when it will be ready for sheep.

Infinitely preferable, however, to any of these useful articles of spring feed for ewes and lambs, is *rowen*, or the after-grass, kept on dry meadows and pastures after the hay-harvest is concluded. Although a field of rowen presents an unpromising aspect at a distance, in colour not unlike very bad hay, yet when this covering is removed, a fine green herbage, from five to six inches in height, will appear; the whole of which is eaten with avidity by the ewes and their young progeny, who are thus supported till they are turned into the pasture *.

* Mr. Young gives it as his opinion, that rowen is the cheapest mode of keeping a full stock in April. If of a tolerable quality, he estimates that it will carry ten ewes on an acre, *together* with their lambs, through the whole of April; and computes its relative value to be, in autumn 10*s*. or 12*s*.: in the spring from 30*s*. to 40*s*. per acre; and, if the season be backward, that a farmer who possesses it would not be induced to dispose of it for a more considerable sum.

With regard to the best time for *weaning* lambs, much depends upon the period, or season, when they were yeaned. When a lamb is to be kept for breed in a good common pasture, it is the practice in some counties to wean it at the end of about four months, in order that it may become strong, and that the ewe may acquire strength, and go quickly to *blossom*. In others, which are more mountainous and poor, the lambs are weaned a month earlier. But, whatever influence local customs may have in this respect, this business should be performed before the expiration of July; and, as it is of essential importance to their future growth, and consequently to the breeder's profit, that due provision be previously made, it will be proper to remove the lambs to a distance from the ewes, to such fresh food as may be most convenient. Clover, while in blossom, is the most forcing food; sainfoin rowen may also be successfully employed for the same purpose; but nothing is superior to a sweet bite of fresh pasture-grass. On weaning the young animals, their dams may be milked two or three times, in order to relieve their udders, which would otherwise become painful.

When lambs have been once stinted in their growth, either by disease or insufficient food, they become what is technically termed *sticky*; after which, although they may be in apparent health, it is out of the power of art to fatten them. It is, therefore, of the utmost importance both that the ewes should have abundant food, in order to produce a flow of nutritious milk while they are suckling; and also that the lambs should have plenty of good pasture, or of other succulent green meat when they are weaned.

Various ages are mentioned as being most proper for *gelding* those lambs which are not intended to be raised as rams for breeding; but the sooner this operation is performed, the better it is for the animal, which is more able to support it while young, and running with the dam, and when there is less danger to be apprehended, from inflammation. The time best calculated for this purpose, in the opinion of the most experienced farmers and breeders, is within the first fortnight, unless the lambs are unusually weak, in which case it will be advisable to defer castration for two or three weeks, or such longer term as may be expedient, till they acquire sufficient strength.

In cattle farms, in general, it is of great importance to dis-

pose, at certain times, of such beasts as either become unprofitable, or are sufficiently fat for sale; and with regard to sheep, in particular, it is highly necessary to pursue the same management, and to replace old ewes, by an equal number of the best and most vigorous female lambs; in order that the value of the flock may not be diminished. In the southern counties of this island, the severing of sheep usually takes place about six, eight, or ten weeks after the shearing is finished, or in the course of the middle of August. In making this selection, great care should be taken to choose those only which give indications of their being of the true breed (whatever that may be); and, according to their comparative strength or weakness, to regulate their pastures. Hence it will be proper to place those animals which are designed for feeding or fattening by themselves; the ewes by themselves; the *wedder* or *wether hogs*, (i. e. males, whether castrated or not, that are of one year's growth,) and *theaves*, or females, that are two years old, by themselves; and the old wethers and rams by themselves; and lastly, the lambs by themselves; otherwise the stronger animals will injure such as are weak, and prevent them from taking that food which would be most beneficial for them.

When a farm is thus stocked with a proper assortment of sheep, it will be necessary for the owner to inspect them often—at least twice in the year—particularly in the winter; and, if the severity of the weather or season have proved fatal to any, he should replace them with others from sound flocks, and as nearly of the same size, quality, and property, of his own stock, as the difference of circumstances will admit. At such annual, or half-yearly musters, it will also be proper to dispose of those animals which do not thrive upon their allotted grounds; but, independently of these examinations, the shepherd ought constantly to continue with his charge, as they are liable to various maladies, which, if not speedily attended to, will carry them off in a few minutes.

Before we close the present discussion respecting the management of sheep, it may not be improper to advert to one or two practices materially connected with them. The first is that of *docking*, or cutting their tails; which prevails not only in this country, but likewise in Spain, Saxony, and, generally speaking, in every district where the inhabitants pay much regard to the

improvement of wool-bearing animals. The tails are usually cut when the lambs are three or four months old; for, if the operation were deferred beyond that time, it could not be performed with safety to the animal. This practice is objected to by some intelligent breeders in England, on the ground that it renders sheep unable to defend themselves against the attacks of flies during hot seasons: by others, however, it is strongly recommended, because it tends to preserve the health of the animals, by keeping them more clean from the ordure which they, in a great measure deposit on the fleece, and gives the animal a square, handsome appearance on the hind quarter. It is very generally adopted, except by some breeders in exposed situations, who, not unjustly, conceive that a long bushy tail affords considerable protection and warmth to the udder of the ewes in very severe weather.

The other practice above alluded to is, that of *extirpating the horns of sheep;* which has hitherto, we believe, been confined to the sheep-walks of Spain, and to the sheep-farm at Rambouillet, in France. The reasons assigned for it, and the manner in which this operation is performed, are thus detailed by M. Lasteyrie *.

"The horns, given by nature to the ram for self-defence, become not only useless, but also inconvenient and troublesome to him when domesticated; they prevent him from pushing his head between the insterstices of the rack, in order to cull the straw, of which he eats only the outer skin; and to select the ears and tender blades of grass that are mingled with it. They very frequently wound ewes when passing through gates; and not seldom do they prove fatal to the rams themselves, when these begin fighting. There are two ways of cutting off the horns, viz. by means of a saw, or with a chisel. In the former case, a very fine hand-saw is made use of; but the English hand-saws are most convenient for this operation. One man takes firm old of the ram's head, a second performs the amputation, which requires only a very short space of time, if the operator is dexterous in the use of the saw."

But M. Lasteyrie remarks, that, "when the horns shoot forth again, it is not uncommon for them to touch some parts of the head, which they gall considerably, and into which they will

* Histoire de l' Introduction des laines fines, &c. p. 236.

sometimes enter deeply, unless they undergo a second amputation."

In fine, throughout the whole system of sheep husbandry, the greatest attention is necessary, on the part of the shepherd, regularly and frequently to inspect the animals committed to his charge. In Saxony the shepherds have no fixed wages, but are allowed a profit on the produce of the flock. From the adoption of this arrangement, the sheep-masters derive great advantage, as the shepherds have no inducement to deceive them, and are themselves interested in taking due care of the animals committed to their charge. How far this practice is feasible in England it would be rash in us to assert; but as the hint seems worthy of attention and trial, we leave it to the consideration of the intelligent reader.

The *Shepherd's Dog* performs so important a part in the management of sheep, that some notice of his qualities cannot be deemed irrelevant to the subject. The species which is delineated in the following page, occurs chiefly in the extensive sheep-walks in the northern parts of this island, where the purity of its breed appears to be preserved in the greatest perfection. Its docility and sagacity, indeed, surpass those of every other variety of the canine race: obedient to the voice, looks, and gestures of his master, he quickly perceives his commands, and instantly executes them. A well-trained dog of this kind is, to a shepherd, an invaluable acquisition. The faithful animal anxiously watches the flock, keeps them together in the pasture, from one part of which it conducts them to another; and, if the sheep are driven to any distance, a well-trained dog will infallibly confine them within the road, and, at the same time, prevent any strange sheep from mingling with them. Should, however, any straggle from the road, he will pursue them, and drive them to the flock, without hurting them in the slightest degree.

In Prussia, there is a peculiar breed of dogs employed in the management of sheep: it is described by M. Lasteyrie as totally different from the shepherd's dogs usually found in France, being of a small size, but stout and thick, with erect ears. The Prussian dogs bear some resemblance to our wolf-dogs: their coats are partly smooth and close, while others are long and shaggy. They are remarkably docile; *never bite the sheep*; and, at their master's voice, repair instantly towards that part of

the flock which is pointed out: in case the sheep hang behind, *these dogs push them forward with their muzzles;* which is sufficient to make the sheep take the requisite direction. An importation, if it could be effected, of a few of this breed would certainly be worth the trial: particularly if the Prussian mode of teaching them, so as not to *bite*, could be acquired. It is, indeed, a most desirable object, that our shepherds should never accustom their dogs to bite sheep; as these naturally timid animals are afraid at the approach of a dog, often crowd together, and wound one another. The continual state of fear in which they are, particularly where a dog has not been properly trained, disturbs their repose, and prevents them from feeding quietly, which is further very injurious to their health, and consequently to the interests of the sheep-master; and, in fact, it rarely happens in any flock, that there are not some sheep which are from time to time lacerated, more or less severely, by the bite of dogs.

CHAPTER IV.

ON THE TREATMENT AND REARING OF HOUSE-LAMBS.

In the preceding chapter, the treatment of lambs intended to be kept for stock, has been chiefly regarded; but, as the price given in the winter, in the metropolis, and in other places where there is a demand for young lambs, is often very considerable, we shall, at present, confine our attention to the rearing of those animals in the house, where they are denominated *house-lambs*.

In this branch of rural economy, two circumstances are worthy of notice: 1. To put the rams and ewes together at such a time, that the lambs may fall at the proper season; an object which may be easily effected by any skilful shepherd: and, 2. That appropriate places be provided for their reception. Where the suckling of house-lambs is intended to be regularly followed, it will be necessary to erect a house of such proportions as the probable extent of the business may require, and to divide the building into stalls, in order that each lamb may be more conveniently suckled and confined. Care should also be taken, not to crowd too many into one house at the same time; as the increased degree of heat, thus occasioned, will render the place unwholesome.

The breed of ewes, best calculated for producing house-lambs, is the early Dorsetshire sort, particularly those whose lambs die *fair*, in the language of the market; i. e. whose flesh is of a delicately-white colour: and from this prolific variety the demands of the luxurious in the metropolis are supplied. The dams are fed with hay, oil-cake, corn, cabbage, or any other green food afforded by the season; which is given in an inclosure adjoining the apartment where the young lambs are confined. The last are shut up in small dark cells, from which the light is excluded; excepting at the intervals when the shepherd suckles them upon the ewes.

Where the system of suckling is carried on to a great extent, it will be advisable to mark the lambs, in order to ascertain which has been longest sucking on the *bastard ewe;* (i. e. such as suckle strange lambs, or have lost their own;) as such lambs ought to *suck a-head*, or be permitted to take the first milk.

As the ewe's milk is the chief support of the young lambs, (though, in the intervals of suckling, some wheat straw may be given them in racks, or wheat or white peas in troughs, together with a piece of calcined chalk for them to lick, and thus preserve them in health,) especial care must be taken to supply her with turnips; or, in case these or other roots cannot be procured, besides turning her into a good warm pasture, she should be fed with brewers' grains, to which may be added a little hay, oats, or bran; but the last-mentioned articles are greatly inferior to turnips, or any of the succulent roots, in producing a flow of milk.

The ewes ought to be conducted to the lambs three or four

times in the day, at nearly equidistant periods; and if any one have a more than ordinary flow of milk, she may be held by the head, while a second lamb draws the udder. During the whole of the treatment, the strictest attention ought to be paid to *cleanliness;* to promote which, the pens or stalls should be well littered with fresh straw; and, by this simple expedient, the animals will, *if kept free from all disturbance,* speedily fatten, their flesh being exceedingly white and delicate. Some estimate may be formed of the profit arising from rearing house-lambs, from the prices given *per quarter* in the London markets. These vary from ten to fifteen, or twenty shillings, according to the demand, so that each lamb sells at from two to four pounds; though the prices afterwards gradually decline, till the ensuing spring affords an abundant supply for the table. Yet, whether from the great trouble of the requisite attendance, or from the precariousness of the result, it is a remarkable fact that, notwithstanding the increase of population, the rearing of house-lambs has, of late years, fallen off.

CHAPTER V.

ON THE FEEDING OF SHEEP.

THE successful feeding of sheep must greatly depend on the quality of the pasture intended for their reception, and upon the resources which the farmer has for supplying them with food during the trying winter months. Hence, as already intimated, it will be necessary to suit them to the pasture, and on no account to purchase or procure sheep from grounds of a superior quality to those which are destined for their support. With sheep, as with other cattle stock, it has been found that the larger breeds are calculated only for the richest and most luxuriant grounds, while the smaller sorts are best adapted for the less fertile tracts, where the grass is shorter; and as the breeds that are most beneficial for particular situations are detailed in the introductory view prefixed to this Book, we deem any further remark on that subject unnecessary.

In the grazing of sheep, as well as neat cattle, various methods are practised, and with different success. Thus, some farmers buy two, or three-shear wethers, early in May, which, for several weeks, are indifferently kept till all the hay has been carted off the meadows, when they are turned into the rowen, or after-grass, and are afterwards *forced* or fattened off during the winter months, so as to be fit for sale at the commencement of March. This practice is very beneficial, if conducted with care, as mutton fetches the most advantageous prices in that month.

Another lucrative method consists in purchasing pregnant ewes towards the close of summer, or early in the autumnal quarter; and keeping them on inferior grass lands, stubbles, or fallow, till the beginning of the following year, when they are kept in good condition through the lambing season, and after that in the best manner possible, so that the lambs may be ready for sale in sufficient time for the dams to be fattened for the butcher early in autumn.

Another profitable practice is, the buying of lambs, whether castrated or not, about the end of August, or in the beginning of the following month. The animals thus acquired are, by some graziers, kept in an indifferent way throughout the winter, till early in April, when they are fattened so as to be ready for sale in August, or are continued to the middle or end of September, at which time the whole stock are cleared off the land. Others, however, adopt a system altogether the reverse of this: having purchased the sheep, as already stated, they force them with the best keep that can be procured, and dispose of them as quickly as possible. Each of these plans has its separate advocates; they are all good; and the preference to either can only be determined by the relative circumstances of soil and situation, the quantity and the nature of the feed.

In grazing sheep, the same remarks are applicable as have been specified in the preceding section. Hence we shall only observe, that the fine grasses produced on downs are, undoubtedly, the best and most congenial food for these animals: good hay alone will fatten wethers; but they may be yet more advantageously prepared for the butcher by means of grass and hay together. Great attention, however, is necessary, that sheep be kept from all grass that is grown in marshy places, otherwise they will become affected with the ROT. And here it may not

be amiss to remark, that the late Mr. Bakewell attributed this fatal disease solely to flooded lands, and the premature, but unsubstantial, herbage afforded by them. Whenever, therefore, particular lots or parcels of his sheep were past service, his practice was to fatten them for the butcher; and, probably from motives of jealousy, in order that he might be certain the animals would be killed, and not go into other hands, he was said to rot them before they were disposed of. This he effected by overflowing a pasture or meadow in the summer, in consequence of which the soil thus flooded inevitably rotted the sheep that were fed on it the ensuing autumn.

Beside humid situations, and the acid grass vegetating there, the tufts of long, rank grass that usually spring up after horse-dung, are injurious, unless the grass has been previously exposed to a few nights' frost, after which they may be turned in without danger. It is also improper to suffer sheep to browse upon fallows that are wet and unsound, as they frequently pull up unwholesome herbs by the roots, which they eat with the dirt adhering to them, which has been thought to give them the rot; though there is much reason to doubt the accuracy of that supposition, which, indeed, is manifestly at variance with the fact, that sheep fed on turnips, with which they necessarily lick up dirt, are not thereby affected with it. The origin of the *rot*, so far as it has been ascertained, is solely attributable to the wetness of the land on which sheep are fed; and its immediate effect is the production of insects, termed *flukes* or *flowks*, which prey upon the liver; but whether these are generated in the animal by the nature of the food, or are derived from animalculæ absorbed with it, is still unknown. It is observable that salt marshes are exempt from this malady; and therefore salt has, not unreasonably, been conjectured to afford a preventive, but its effects have not been sufficiently tried: the best is a dry pasture. In such pastures, however, as are subject to give sheep the rot at certain times, it will be advisable to let the lambs run with the ewes; the longer the better; for though these tender animals are more susceptible of injury in those unsound places than full-grown sheep, yet they are seldom attacked with the rot, suckling having been found a preservative against it.

Further, in turning sheep into pastures, particularly water-meadows, and also into those places that are subject to rot, it

will be necessary to pursue the same precaution as with neat cattle, viz. previously to satisfy the craving of appetite, by giving them hay or cut straw; and, after the dew has been evaporated by the rays of the sun, to drive them gently round the field for two or three hours, before they are suffered to feed. But, whenever any sort of dry food is given, they ought to be supplied with *pure water*, particularly during the intense heat that usually prevails during the *dog-days*, and which often renders the grass as dry as stubble. For this purpose, clear, light running water is always to be preferred, where it can be obtained; though, in general, whatever water presents itself is made use of. But, where this necessary of life is found only in a tainted state, or overcharged with the juice of dung, it will be advisable to give them well-water in troughs, or shallow tubs. This must be particularly attended to in the folds, so long as the sheep are confined there by the severity of the weather*.

The best time for turning sheep into summer pastures is in May, when every attention should be paid to proportion the number according to the luxuriance of the grass; and, as these animals are with difficulty restored to good condition when injured by want of sufficient food, it will be advisable rather to understock than to overburthen the land. It is, however, worthy of notice, that by pursuing a system of *close feeding*, the plants will not only be prevented from running up to seed, and consequently, being preserved longer in the leaf, will afford a greater supply of food, but also those grasses, which are naturally coarse

* The watering of sheep is, on the continent, regarded as a circumstance of the greatest moment, and accordingly receives that attention which it requires. Thus in Sweden, and at the national farm at Rambouillet, in France, they are daily watered with running water, or with that obtained from lakes or springs; *stagnant* water being most properly and rigorously prohibited. In some of the Saxon sheep-farms, the sheep are watered in the cots or folds during the winter, instead of taking them to watering-places. Spring or well-water is conducted, by means of pipes, into troughs, out of which the sheep drink at pleasure; they in consequence drink oftener, and each time take less water, which is favourable to their health. The ordinary mode of watering sheep in that, and, we may add, in many parts of our own country, is attended with many inconveniences. The animals refuse to drink water in the winter, if it be too cold; they hurry while drinking; and do not take enough when the weather is very windy, or hail, rain, or snow falls. Besides which, they often disturb the water with their feet; this disgusts them, and, at length, one part of the flock completely prevents the other from approaching the watering-place.

and unprofitable, will be kept down, and become sweet and valuable.

The number to be allotted to an acre depending on the weight of the stock, the richness of the soil, and the forwardness of the pasture, it must be evident that no general rule can be applicable to this portion of management, which must be wholly regulated by the combination of those circumstances.

Of late years, it has become a frequent practice to soil sheep during summer with the various artificial grasses, with cichory, tares, peas in the haulm, and beans: and to supply them with corn, as well as green food, during the winter. In this view, barley-meal, when abundant and cheap, may be advantageously combined with green meat, and will speedily fatten wethers: pulverized oil-cake has also been given; but as it is apt to impart a peculiar flavour to mutton, it may be beneficially replaced by corn, ground or in a green state, by hay, straw, and fog, or after-grass reserved for this purpose. Borecole and burnet also supply excellent food for sheep during the winter, particularly towards the close of that season. But few vegetables are at present in greater request than turnips, as an article of winter keep; they require, however, to be sliced, to prevent accidents; as also do potatoes, which, when steamed, contribute rapidly to fatten sheep.

There are, however, various methods in use of giving turnips to sheep. By some farmers, they are promiscuously turned into a field, and allowed to eat the roots at pleasure; while one man with a common instrument used for that purpose, will turn out and break as many roots as will serve a large flock, and his hire will be more than compensated by their being eaten clean up. Others divide their land by hurdles, and inclose the sheep in such a space as these can clear in one day, advancing progressively through the field, till it is cleared. But, in either case, care should be taken not to turn them in until the dew is off in the morning, as by their eating the turnip-tops they would be subject to become hoved. Another method is, to pull up such a quantity of turnips as they can consume in one day, when they are successively admitted into the various inclosures; and in wet weather, or when it is not an object to feed off the turnips on the ground on which they are grown, this is an advantageous mode.

Each of these methods has its advantages; but a more profitable plan than either, is to eat off the crop by two successive

flocks of fattening and store sheep. By allowing the first the range of the field, they will scoop out such turnips as they prefer, and will thus satisfy their appetites better than where the turnips are dug up: a most material point, it may be observed, to be considered in fattening all cattle; which should always be indulged, when that is possible, with such food as they prefer. The store sheep may then follow, and the roots and pieces left by the former should then be taken up for their use. One man with a common picker, used for the purpose, will turn out and break as many as will serve a large flock, and his hire will be more than compensated by their being eaten clean up; while, if that were done by the fatting flock, it would perhaps rather check than forward their improvement. When the turnips are hurdled off to be eaten on the land, they should always be taken up; as otherwise, in so small a space, they would be trodden under and spoiled; if not taken up, the sheep should be allowed more room.

But the fattening of sheep cannot be conducted to advantage without regularity in distributing, and economy in the management of, the various articles that compose their food. Hence it will be necessary to have troughs, with partitions in the middle and racks annexed, about two feet high from the ground, the whole being firm and steady, so that it cannot be overturned. This contrivance is well calculated for use, whether at home or abroad, for the prevention of waste; with the same intention, the machine delineated in the annexed figure has been successfully employed in the county of Lincoln.

This contrivance is denominated a *tumbril:* it consists of a circular cage or crib, which may be made of osiers, willows, or other pliant brushwood. The whole is about ten feet in circumference, and closely wattled to the height of about one foot, above which it is left open for the space of eighteen inches; it is then wattled again to the height of eight or ten inches, and an opening about eighteen inches in breadth is left at the top for putting in the roots or other food, whether green or dry; and if deemed expedient, a cover may be added. The staves which form the skeleton of this utensil are ten inches asunder, so that twelve sheep may feed at the same time in each tumbril *.

* Repertory of Arts and Manufactures, Vol. IV. First Series.

Considerable benefit may be derived from the adoption of the simple contrivance above represented for the purpose of feeding sheep; for it not only effects a material reduction in the consumption and expense of provender, which is thus prevented from being trodden under foot, or soiled with dung; but also, in this state of separation, the stronger sheep cannot drive away the weaker, as each is secured by the head. Besides, as the construction of such a tumbril is attended with no difficulty, it may be easily procured, and conveyed to any part of the farm; and, with due care, may be kept in constant use for eight or ten years. The sheep-cribs and racks in common use, are too well known to require description.

But, whatever system of management may be adopted by the farmer, whether at home or in the field, he ought on no account to withhold salt from his live stock, especially from sheep; for not only does the continual use of that article contribute to the digestion of succulent vegetables, and of course preserve the animals in constant health, but it is also said to improve both the quantity and the quality of the wool. Hence, as it augments the nourishment of the food eaten in proportion to the quantity of saline matter, it ought to be particularly used in those moist situations, the produce of which is liable to *rot* sheep, of which malady it is affirmed to be both a preventive and a cure. Rock-salt is undoubtedly preferable; but, where

this cannot be conveniently procured, it will be advisable to dissolve common salt in water, and after mixing it with fine, pure clay, or with pulverized and sifted chalk, to form the whole into masses or lumps, which may be placed under shelter, so that the sheep may lick it at pleasure.

The importance of salt in preserving the health of sheep is not generally known, or appreciated, by many breeders of this island, who do not give it in any form. The same prejudice exists in Prussia and Holland, where no salt is allowed to these animals, which, in so moist a country as that of Belgium, is rather singular. As far, however, as the use of salt, considered as a preventive of the rot, is concerned, the not giving it is compensated by the numerous alder-trees that grow in Holland, and which, we are informed by M. Twent, an experienced Dutch breeder, sheep eat with uncommon avidity in wet weather, and are thus preserved from the *rot*, even when they are suffered to pasture in marshy places.

On the contrary, at Rambouillet, in Silesia, Saxony, Sweden, and Spain, salt is considered as a most important article, and the use of it is most strongly recommended. In Sweden, they give salt, particularly in rainy or damp weather, and frequently add to it wormwood, or some other bitter vegetables, juniper seeds or berries, and even pitch. All these articles are reduced to powder, and, after being diluted with water, are carried to the stable or sheep-house, and put into the trunks of trees, which are excavated expressly for this purpose. At the circumference of the trunk are fastened three or four pieces of wood, which rise vertically about a foot and a half above the edges of the trunk, in order to keep the sheep from leaping over it, as well as to spread out or to salt their food. The preparation just stated is considered as an excellent preventive of several distempers, particularly the dropsy, to which the Swedish sheep are very liable. In this country, the high duty on salt has hitherto prevented its employment for many agricultural purposes, to which it might be beneficially applied; and to none more advantageously than in the feeding of cattle; but as that objection now, happily, no longer exists, it is to be presumed that it will be gradually brought into use.

The preceding statements have been given chiefly with reference to the fattening of sheep profitably for the market; but it ought never to be forgotten, that the growth of the wool is

liable to be materially affected by the system of feeding pursued. *It is essential to the evenness and strength of the staple, that the feeding of the animal should be uniform, without any sudden interruption or transition:* for, where this is suffered to take place, the natural progress of the wool is checked; a second growth succeeds; and the point of contact becomes so weak as to snap under the operation of the manufacturer; who, being aware of this disadvantage, cannot of course afford such a price for wool of this description, as he could for that of a more perfect staple. Much wool is injured in this way between summer and winter keep, which should be made to blend as gradually as possible, that the mischief above described might be prevented, and a sudden transition from rich to poor diet, or from poor to rich keep, ought carefully to be avoided.

CHAPTER VI.

ACCOUNT OF SOME EXPERIMENTS ON FEEDING SHEEP.

In the preceding chapter, we confined ourselves to the common vegetables usually employed in this country in feeding sheep which long experience has proved to be the most advantageous; but we think the following detail of some novel experiments on their food may afford some further useful hints respecting the value of other substances, even should their employment be not immediately expedient. The first were made by M. Cretté de Palluel, and by him communicated to the Royal Society of Agriculture of Paris, in 1789, of which the substance is as follows:—He states, that the practice of feeding sheep in houses was commonly adopted in many of the provinces of France, where they were fed with clean corn (i. e. barley and oats, sometimes gray peas, beans, and rye,) and sweet, fine hay; and that, when roots were given in lieu of corn, clover, rowen, or lucern hay was continued. Though the sheep thus fed on roots did not become so fat as those which were corn-fed, yet

they all fattened: and he thinks they would have made greater progress, if their food had been varied. This opinion he supports by an experiment made on four, whose food was changed, and the animals ate considerably more. The sheep which were put on potatoes, were for a few days somewhat averse to them, and at first ate but little; consequently they did not thrive so fast; though they recovered in the second month what they lost in the first. Those which were fed on turnips and beets, ate heartily of them from the beginning, and continued so to do. They all drank much less than those which were corn-fed.—M. de Palluel thinks that corn might be advantageously added to the roots; and, when the sheep are destined for sale, if two feeds of corn be given them for a fortnight, in the intervals between their meals of roots, this would give a degree of firmness both to their flesh and tallow*.

A very valuable addition to the articles of sheep-food has been made by employing muscovado sugar. Under the direction of the Board of Agriculture, a series of experiments was undertaken by the late Rev. Dr. Cartwright, in order to ascertain the daily quantity of brown muscovado sugar necessary to fatten sheep; to shew its effects and value when so applied; and to demonstrate what substance sufficiently cheap might be mixed with it, so as to prevent its application to common uses, and yet render it not unpalateable or pernicious to animals feeding upon them. It should be stated, that these experiments originated in a suggestion of the Parliamentary Distillery Committee of 1808, that the drawback on sugar should be allowed to the farmer for agricultural purposes, on his mixing it with some substance, which would render it unfit for common uses, in the presence of an excise officer. This suggestion was not embodied into legislative enactment; but Dr. Cartwright availed himself of a short interval of leisure, in order to ascertain how far the proposition might be practicable. The following is an

* This interesting account is abridged from the "Mémoires de l'Academie Royale d'Agriculture," of Paris, for the year 1789.

There can be no doubt that corn and pulse are the most efficient food in fattening all cattle; but the consideration for the grazier is not only what will *soonest*, but also what will *most economically* effect that object; and in that important view, it is much to be doubted whether grain can, in this country, be profitably applied to sheep. Ed.

abstract of his extensive detail addressed to the Board of Agriculture:—

The flock of sheep purchased for the purpose of instituting a set of experiments to ascertain the facts enumerated in the title of the paper, consisted of fifteen two-shear Down wethers, which were bought at Chichester, 24th of August, 1808; they were bred upon the Downs, and had been folded through the summer, and were in a common store state. They were weighed on the 27th of August, and their average weight was 90¼lbs.; the price was 35*s.* per head. For the first week they were folded every evening, and had half a pint of bran and a quarter of a pint of peas each; and the same was given them when they left the fold in the morning. In a week they became habituated to dry food, and then to this quantity of bran and peas was added an ounce of sugar for each. When they were familiarized to this, the next object of Dr. Cartwright was to try what different substances might be given in addition to the sugar, which would not be injurious to them, and which they would not reject, and which at the same time would spoil the sugar for all other purposes; and he thought it better to try the experiment with the different substances, while the sheep had access to the grass field, rather than wait till they were kept upon artificial food altogether.

The substances used for this purpose were, linseed-oil, train-oil, palm-oil, oil of hartshorn, assafœtida, urine, antimony, and charcoal; most of them preventing the sugar from being used in distillation, and all of them spoiling it for common purposes. Linseed-oil was first tried, in the proportion of one to thirty-two parts of sugar. This mixture was given for the first time on the 7th of September, and was put into one only of the three troughs out of which they fed; the sheep, however, ate indiscriminately, and apparently with the same appetite, the mixture which contained the linseed oil, as those which had the sugar only; on the following day the quantity of oil was doubled, and the sheep continued to feed upon it with the same appetite. After this, train oil was given in the same proportions, and with the same success; and it was supposed, from the particular avidity with which they devoured this mess, that the train-oil so far from rendering the sugar less palateable to them, gave it a more agreeable zest and poignancy. The next

experiment was with assafœtida, in the proportion of one to four hundred and forty-eight parts of sugar: part of the sheep began upon this mixture immediately, but others hesitated, and when they did feed, it was somewhat fastidiously, and the troughs were not emptied quite so clean as before. This experiment was suspended at that time, and a trial made of a mixture of sugar with urine, in the proportion of one part sugar to twenty-four of urine; but an obstacle, from swarms of bees devouring the mixture as soon as put into the troughs, prevented the experiment from being carried on at the usual hour, and the mixture was obliged to be given to the sheep in the evening instead of the morning; they were, however, no sooner accustomed to the change of time, than they fed upon it as greedily as upon the other mixtures, and there was no reason to conclude that the urine had any influence in abating their appetites, or was in any degree offensive to them. The experiment next in succession was with palm-oil, which appeared very likely to answer the purpose of the experiment, and as far as the sheep were concerned, it fully justified the expectation; for they did not seem conscious that any variation had been made in their usual repast. The experiment with assafœtida was then renewed, and the sheep fed on this as readily as on the other mixtures; it was given in the proportion of one part to two hundred of sugar. The next experiment was with the empyreumatic oil of hartshorn, a substance uncommonly offensive to the smell; but even this was not rejected by more than two or three sheep, and not by them for more than a day or two; the proportion of it was one in two hundred and twenty of sugar. Tartar emetic, in the proportion of two hundred and forty of sugar, was afterwards given, and produced no ill effect on the bowels of the animals. Dr. Cartwright being convinced, from these experiments, that of the substances recommended for the purpose unfit for common uses, and of which he had made the trial, there was none which sheep would reject when mixed with sugar, in proportions sufficient to answer the end proposed, thought it might be also satisfactory to the Board to know in what larger proportions the oils might be given before the sheep would betray symptoms of disgust. Linseed-oil, train-oil, and palm-oil, were given in the proportion of one to eight, and the allowance of sugar at the same time in-

creased to two ounces each per day; and these mixtures appeared to be equally as palatable to the sheep, as any thing which had been administered, and produced the same results, and without occasioning any change in the state of the bowels.

On the 29th of September the sheep were again weighed, when their average weight was nearly 109lbs. each, being an increase of upwards of one-fifth of their original weight; and they were tolerably fat, though it was the opinion of the person who purchased them, that they would not make themselves fat on grass only before Christmas.

From the 24th of September to the 22d of October, their allowance of food was increased to a quart of bran per day, one pint of peas and three ounces of sugar, ringing changes at the same time with the different substances with which the sugar was debased, which was done to discover the particular substance they most relished; and though they appeared to be extremely fond of all, yet, if a conjecture might be hazarded, the preference was in favour of train-oil. Dr. Cartwright, however, suggests, (if the practice of using sugar in this way should be adopted,) that instead of employing any one of these articles singly, it would not be unadvisable to use a composition of several of them together, which would be attended with no additional expense; and he recommends,—instead of mixing, for example's sake, four pounds of palm-oil, with one hundred weight of sugar,—that four pounds of a mixture be substituted, composed of palm-oil 1lb., train-oil 1lb., urine 2lb., emetic tartar 2oz., assafœtida 24 grains, and oil of hartshorn 28 drops; since in this composition are comprised an animal, a vegetable, and an empyreumatic oil, a substance containing ammoniacal and other salts, metallic calx, and a resinous gum; and the whole expense of which would not exceed one shilling and eight-pence upon each hundred weight of sugar. He is also of opinion, that the most practicable way of managing this business, would be to have only one person or company in each sea-port, where sugar is imported from the West Indies, licensed to sell it in the adulterated state.

This detail of the experiments is thought by the author to have afforded a very satisfactory conclusion, that sugar thus adulterated may be advantageously given to sheep, and indeed to other animals; for a horse was equally fond of it, and both

sheep and horses are known to be delicate feeding animals compared with cattle *.

On the 22d of October, the sheep were again weighed, and were found to have gained an average increase of weight of 15lbs. each since the 29th of September; they were then taken into the house, and kept upon artificial food altogether; but one of them appearing to droop, that with two others was sent to the butcher, and the remaining twelve, reserved for further experiments, had no sugar in their food for several days, that they might be reconciled to its omission, and might all start fair, without any preference of means.

On the 2d of November these were divided into three classes of four sheep each, and were weighed on the 12th, when a very inconsiderable gain was perceived, which was accounted for from their not being yet reconciled to confinement. An attempt was now made to adulterate their food with charcoal, but this part of the experiment was soon given up, from the difficulty of obtaining it sufficiently pulverized; bran, peas, and hay, were given to all, and to the first class six ounces of sugar each per day, to the second class four ounces each, and to the third class none. They were weighed every week, and the respective weights of each are given in Dr. Cartwright's original communication, but the increase of weight was not considerable, and sometimes one class and sometimes another had the superiority. Their progress in confinement was not equal to that which was made when they were at liberty; and both those which had only four ounces of sugar per day, and those which had no sugar at all, made rather more progress than those which had a daily allowance of six ounces, and the advantage was rather in favour of those which had the four ounces.

From all the facts taken collectively, Dr. Cartwright draws the following conclusions:—

> "1. That sugar may be given with great advantage to sheep, if not confined, especially if they have access to green food, however little that green food may be in quantity.

* In the West Indies, it is a common practice to give molasses to both oxen and horses: it is mixed with their water, and materially assists in improving their condition.—Ed.

"2. That sugar may be given to them with every prospect of a beneficial effect, in the quantity of four ounces per day to each sheep.

"3. That sugar, supposing it to be purchased at fourpence per pound (which it might be if duty free), would at the rate of four ounces per day be paid for in a return of flesh, exclusive of the advantage of expeditious feeding, and the benefit to be derived from the manure.

"4. That six ounces per day to each sheep exceeds the maximum that can be given with the best advantage to sheep of the size of South Downs.

"5. That the advantage of stall-feeding sheep altogether upon sugar and dry food, of whatever nature that food may be, is extremely problematical." *

On these ably conducted experiments we have only to remark, that in our judgment, Dr. Cartwright has fully shown the practicability of feeding sheep at least, if not other cattle, partly with sugar; and that, were the duty taken off, the farmer might beneficially avail himself of this article, and also benefit the sugar planters, without interfering in any degree with the distilleries.

Some experiments, tried on dogs, by the celebrated Dr. Magendie, have been adduced as proofs of the fallacy of the commonly received opinion that sugar, gum, oil, butter, and other similar substances which do not contain azote, are nourishing articles of food.

He fed those animals separately on sugar and water, olive-oil and water, gum and water, and butter; and they all died within thirty-six days. But these experiments cannot be considered conclusive; for it appears, from other trials, that the stomach requires *substance* as well as nutriment: thus, of two dogs, one fed on the jelly extracted from beef, and the other on the fibre of the same beef, from which all its nutritive matter was supposed to have been exhausted, the one fed on the jelly died, whilst the other throve. The sugar, and other substances ought, therefore, to have been combined with solids in order to arrive at the desired conclusion.

* Communication to the Board of Agriculture, Vol. VI. Part II.

CHAPTER VII.

ON FOLDING SHEEP.

With regard to the practice of folding sheep, there is a difference of opinion among graziers and breeders. Many farmers give a very slight dressing, one night in a place, and the fold three square yards per sheep; whereas they ought to be folded two nights in the same spot, and one, or at most two, square yards allotted to each animal; for if arable, the ground should be perfectly black, and if grass, well covered with dung. The common calculation is that 3000 sheep are sufficient to fold an acre in one night; but it is evident, that the quantity of manure must depend upon that of the food consumed; and its value will be in proportion to the fattening quality of the provender: thus the dung of sheep fed on oil-cake is of a much more fertilizing nature than that produced from turnips; but the latter afford the largest amount. The kind of sheep must also influence the number to be folded; the larger and coarser-feeding breeds requiring more space and yielding more manure than the small heath species. On the South Downs the calculation is 500 to 28 square perch.

These hints, however, are given on the supposition that the openness or other circumstances of the farm render the practice of folding necessary; for though it still prevails in some districts, yet it is attended with many inconveniences, which have induced several eminent farmers to discontinue it. Not only, indeed, are those lands, which are in any degree moist, liable to be poached by the treading of the animals, but also these, by being driven three or four times in the day to the fold, are liable to be excessively fatigued; so that the stronger sheep only can feed without receiving much detriment. Besides, young lambs are often seriously injured; the ewes are liable to be hurried and heated; and as the sheep are, in fact, moving throughout the day, the weaker animals are thus prevented from feeding at pleasure, while no inconsiderable portion of food is trodden under foot, and irreparably wasted.

The late eminent Mr. Bakewell was decidedly averse to the

practice of folding; considering the advantages supposed to be derived from it as visionary; as, in fact, robbing a large portion of a farm in order to enrich a small part. He was of opinion that the keeping of large flocks together, even of any number exceeding a hundred, is a barbarous practice, as the strongest will always consume the best food, which ought to be appropriated to those which are less hardy; and observed, "that if folding be necessary on farms that have no commons appendant to them, why should there not be different small folds, on different parts of the farm, for animals of various ages, kinds, and strength, and thereby save the trouble of driving them from one part of a farm to another? For, is it not preferable, after the animal has filled its belly, that it should lie down to sleep (and let it not be forgotten that repose contributes materially to promote fattening) than travel, in order to create an appetite?" From extensive and accurate observations, in various parts of this island, Mr. Bakewell became confirmed in his opinion of the inefficacy of folding; and his example has been followed by Messrs. Young and Coke, (two of our most enlightened agriculturists,) both of whom have relinquished the practice; for, however beneficial it may be to the folded land, it has been found prejudicial to the sheep, unless when it has been resorted to for the purposes of shelter. There are, however, many light soils which cannot be tilled to advantage without the assistance of the fold, and on these the custom is necessarily continued: but it is only properly applicable to fold flocks and store sheep; for the purposes of folding and fattening are wholly distinct, as are the breeds most appropriate to each. The fold requires a hardy, active animal that can bear fatigue; but that which will stand still and eat, is best adapted for the grazier.

The idea above suggested, by Mr. Bakewell, of keeping sheep in small flocks, is very important, and productive of much advantage; it has been adopted, in its full extent, by Mr. Boys, of Betshanger, in Kent, who has divided his numerous sheep into four flocks, each of which is committed to the care of a distinct shepherd; and who is so convinced of the profit of the plan, that he would not for a moment admit that any question could be made of it.

Having already pointed out the most useful criteria for seps-

rating sheep into small flocks, we shall only observe, that though *straggling* folds are evidently an expensive as well as injurious practice, every advantage which can be expected from them may be derived by having *standing* folds, either erected on dry spots, and in the most convenient parts of the farm (where this is very extensive); or a part of the farm-yard may be fenced in, and provided with sheds open towards the sun, and having pens for receiving the flocks accordingly as they are separated, so that the sheep may be let out to exercise themselves on the land for a few hours in the middle of the day, unless the weather be extremely unfavourable. In this system of *cotting*, the floors of the various sheds ought to be well beaten in, and laid on a slight declivity, for the discharge of the urine, which, as well as the dung, should be frequently removed, for cleanliness is essential to the thriving of these animals. The practice here stated, will, indeed, render an abundant supply of litter necessary, and whether the additional expense thus incurred is compensated by the supply of manure thereby obtained, is worthy of consideration. It appears, from an experiment on record, that 134 sheep, and 30 lambs were penned for six weeks, in a standing fold, and littered with one load of straw, per week, which produced *twenty-eight* large loads of dung. They were fed morning and evening in the fold with drawn turnips, and, during that time, consumed two acres of those roots, thus:—

Valuing dung at 7*s.* 6*d.* per load	£10	10	0
——— straw at 20*s.* per load	6	0	0
There will remain	4	10	0
or, per acre for turnips	£ 2	5	0

There can be no doubt that all animals soiled in yards or stables will produce more manure, in the proportion of the litter, than those which are fed in open fields: and it is also more than probable that a fermented compost, so made, will prove more effectual, when regularly spread over the land in due season, than dung promiscuously dropped at various periods. These observations more especially apply to heavy cattle; which, besides being apt to poach the land, do not distribute

their dung so equally as sheep. But, independently of the fact, that the treading of sheep is beneficial to light soils, there are the important considerations of convenience, expense, and comparative profit. With regard to the first, it is not always convenient to spare men and teams for turning, carrying out, and spreading manure: then the expense of all that labour must be deducted from the value of the dung: and lastly, considering that 3000 sheep will fold an acre of land in a night, and considering the number mentioned in the experiment as equal, with the lambs, to 150 sheep, it follows, that in six weeks they would have folded two acres, *without the straw.* It is unnecessary to pursue the calculation, for it is sufficiently obvious that it turns the scale of profit, *on the mere manure,* in favour of the common fold; but with regard to the more important consideration, the health of the sheep, there can be no doubt that the standing fold is more beneficial in severe weather, and more particularly to fatting stock. On the score of expense it should, however, be remarked, that the litter charged in the experiment is unnecessarily dear. Straw, used upon a farm, can only be considered worth twenty shillings a load for the purpose of feeding; and, in this instance, fern, or dried leaves, if procurable, or stubble, would have answered the purpose equally well, while a material difference would have appeared on the account.

The respective advantages, and disadvantages, of these several methods may be thus concisely stated:—

The common *moveable fold* allows the land to be manured without any further cost than the trouble of removing the hurdles: but, being usually placed upon arable land, the dirt is injurious to the fleece; it prevents the sheep from fattening; and the wet retained by the ground is prejudicial to their health.

The *standing fold* admits of the most convenient choice of situation; and, whether littered or not, allows of the dung being accumulated to form a compost, and applied to the land at the most proper season—advantages which the standing fold does not possess; but it occasions the additional expense of removing the dung, forming the compost, and spreading it on the soil.

The *cote* combines all the advantages, and disadvantages,

of the standing fold, with the additional merit of affording superior shelter; but it also occasions the additional expense of the erection of sheds.

As to *housing* sheep in close stables, it is contrary to the nature of the animal, and is a practice by no means to be recommended, except when it may be absolutely necessary to shelter ewes from great inclemency of weather at lambing time; and even then, an inclosed yard, or at most, an open shed is preferable. Except in such cases, it may, indeed, be very questionable whether the animal is benefited by any of these methods. Nature has provided it with a covering which effectually secures it against cold and rain, and has evidently adapted different breeds to different climates: the hardy mountain sheep braves every kind of weather, and not only thrives on the most scanty herbage, and in the most exposed situations, but is even found to degenerate on richer soils. It is the introduction of tender breeds on land not adapted to them that has occasioned any necessity for shelter, unless when it may be prudent, on the bleak hills of the north, to guard against the consequences of snow storms; or when, from the absolute failure of field pasture, it may be expedient to pen the sheep for the purpose of more conveniently feeding them.

With respect to the fold, it can only be considered advantageous in so much as regards the land; and notwithstanding the objections already stated, it must be admitted that there are many arable hill-farms which could not be cultivated without such assistance. In such situations, it is sometimes next to impossible to manure the land in any other way; and although, from the injury done to the sheep, and the increased consumption of food—folded sheep having been ascertained to eat more, in consequence of additional exercise, than those which lie quiet in their pasture—it may be said, "that folding is gaining one shilling in manure by the loss of two in flesh," yet the expedience of the system is still a mere matter of calculation of the relative profit to be obtained by growing corn or feeding sheep.

CHAPTER VIII.

ON THE SHEARING OF SHEEP.

THE *shearing* of sheep, and the profit thence derived from the wool, form a very considerable article of rural economy. The most proper time for this purpose must be regulated according to the temperature of the weather, in the different parts of this island. If the weather be hot, the month of June may be fixed for shearing, or clipping these animals, though some breeders defer it till the middle of July; under the idea, that an additional half pound of wool in every fleece may be obtained, in consequence of the increased perspiration of the sheep. An early shearing, however, is preferable, where the weather and other circumstances will admit of the operation being performed; because the new wool will not only gain time to *get a-head*, but the animal will also be secured from the attacks of the fly, to the depredations of which it becomes liable by delaying the operation.

Previously, however, to shearing, the sheep ought to be washed, in order to remove the dust and other filth which they may have contracted; this is usually performed by men standing in the water, who, not unfrequently, take serious colds, or are otherwise indisposed in consequence; while their employer is put to a useless expense, in order to supply them either with a medicated liquor, known in some counties by the name of *lamb's wool*, or with ardent spirits. To prevent these inconveniences, as well as the abuses resulting from the careless or negligent manner in which the washers do their work, Mr. Young proposes to "rail off a portion of the water," (either of a running stream or of a pond,) "for the sheep to walk into, by a sloped mouth at one end, and to walk out by another at the other end, with a depth sufficient for them at one part to swim; pave the whole; the breadth need not be more than six or seven feet; at one spot, let in on each side of this passage, where the depth is just sufficient for the water to flow over the sheep's back, a cask, either fixed or loaded, for a man to stand

in dry; the sheep being in the water between them, they swim through the deep part, and walk out at the other mouth, where there is a clean pen, or a very clean, dry pasture, or rick-yard, to receive them for a few days, until they are thoroughly dry, and fit for the shearers; the lambs being first separated from the other sheep, and confined in distinct pens. Of course," adds that enlightened agriculturist, " there is a bridge-railway to the tubs, and a pen at the first mouth of the water, whence the sheep are turned into it, where they may be soaking a few minutes before being driven to the washers."

Where, however, much dirt has fastened itself at the points of the wool, and the haw and yolk cannot be dissolved in cold water, the " Farming Society of Ireland" think it might be wise to have a large tub of water at about blood heat, in which to place the sheep, till all the wool shall be well washed and softened, and that it should be river-washed directly after. This process, the Society observe, would not be so troublesome as might be supposed; for the heat of the animal will keep nearly a sufficient warmth in the water, which will at all events be produced by occasionally putting in a few pails full of hot water. And it is a fact worthy of remark, that *the greater the number washed, the better will the water cleanse.* On this subject, Mr. Bakewell also says, " It would be desirable that the Spanish and mixed breeds of sheep were also washed in this way, because it is not possible to cleanse the fleece by the usual practice of immersion in a river, without keeping the animal a long time in the water, and thereby endangering its health. Indeed I do not think the Spanish fleeces can be cleansed by the usual mode of washing, on account of the closeness of the pile. Were the Spanish sheep in this country washed before shearing as clean as the English, the value of their wool would be better ascertained by the wool-buyer, and a more general competition of purchasers would always insure a fair price for the article.

" The extra labour required to wash sheep in tubs with warm water and lie, or soda, would, I apprehend, be amply repaid, were the water of the first and second washings carried out and applied as a manure. The quantity of rich animal soap it would contain must make it one of the most fertilizing applications which could possibly be used. The greased wool would require a greater quantity of soda to cleanse it than

that of the Spanish or mixed breeds, where no ointment had been applied. I annex Baron Schultz's account of the Swedish manner of washing sheep: I think some improvements upon it will suggest themselves to the intelligent wool-grower.

"Before the shearing, the wool with us is almost universally washed upon the sheep. Some persons wash the sheep in the open sea, or in running water, but this is never so clean as when the sheep are first washed in a large tub, with one part clear lie, two parts lukewarm water, with a small quantity of urine; and then in another tub, with less lie in the water; after which the sheep are washed, laying them always on their backs, with their heads up, in a tub with clean water; and lastly, there is poured out on the sheep, standing on the ground, a sufficient quantity of water, which is as much as possible squeezed out of the wool. The sheep are afterwards driven into an unpastured adjoining meadow, and remain there (to prevent their soiling themselves in the sheep-house) a day and night, not only till they be dry, which in good dry weather happens within the third day, but also, if bad weather does not threaten, some days longer. Some persons wash their sheep twice, which I also once tried, but the wool becomes rougher in consequence of it, and in fact of a grayer appearance. The great quantity of grease which the finest Spanish wool contains at the first washing, mixes with the lie-water, and makes it quite soft and soapy; but this grease is wanting in the second washing, so that the water is not in the least softened. If the first washing be well performed, the wool is by that means several per cent. cleaner than the foreign wool that is imported, which has not been washed after the shearing."*

In washing sheep, the use of water containing the carbonate of lime (pure chalk) should be avoided; for this substance decomposes the yolk of the wool, which is an animal soap, the natural defence of the wool; and wool, often washed in calcareous water, becomes rough and more brittle. The yolk is most useful to the wool on the back of the sheep in cold and wet seasons. Sir Humphrey Davy (to whom we are indebted for this fact) thinks that the application of a little soap of potassia, or pure caustic vegetable alkali, with excess of grease to the sheep brought from warmer climates to our winter,—that

* Bakewell on Wool, p. 72.

is, increasing their yolk artificially,—might probably be useful in cases where the fineness of the wool is of great importance*.

As the comparison of different practices, by eminent breeders, greatly tends to improve the method which any individual may be in the habit of following, the subsequent notes, relative to the practice of some very eminent graziers on the Continent, we trust, will not be deemed irrelevant to the subject above discussed.

In Sweden, the business of sheep-shearing commences early in July: some breeders there simply wash their sheep in running water, while others bestow more attention upon that operation. They put the animals in shallow tubs, where they wash them with warm water and urine, and afterwards cleanse them with pure water. After they have been thus washed, the sheep are allowed to run in a meadow for two or three days, or even longer, if the weather will permit; in order that the fleece may imbibe a new yolk, which imparts a greater degree of softness and elasticity to the wool.

In Silesia, the latitude of which corresponds with that of many of our finest grazing districts, the method usually practised simply consists in making the sheep cross a running stream, after obliging them to plunge into the water from a pretty high bridge.

The method chiefly pursued in the fine country of Saxony, consists, first, in making the sheep cross a brook or river; on the second day, in the morning, they are again made to pass through the water, in which they are dipped, in order that the fleece may be uniformly penetrated; after which they are stroked, or pressed down with the hand, beginning at the head, and thence proceeding to the extremities of their bodies. They are also led once, in the afternoon, across the stream; the fleeces are allowed two days to become dry, and on the third day they are shorn. A shearer dispatches twenty-five sheep in one day. When an animal is wounded, the part is anointed with its excrements, or with a mixture of linseed oil and resin. The shearing ceases about three o'clock in the afternoon, that the beasts may have time to feed in the meadows, whither they are gently driven after they have undergone the operation. After the shearing, some graziers fold their sheep for two or three weeks, sending them proper rations of food†.

* Sir H. Davy's Elements of Agricultural Chemistry, p. 370, 2d edit.

† For these interesting facts we are indebted to M. Lasteyrie's very valu-

In Spain, the sheep are shorn in large buildings constructed for that purpose, and the operation is conducted by persons who are not themselves proprietors of flocks, but who make this branch of the management their peculiar business. The fleece is then assorted into the different qualities, and carefully washed in warm water; but not more than is merely necessary to cleanse it from impurity, as too much washing is supposed to render the wool brittle. The fleece is thus cut and stapled at the same time; and as many as 800,000 sheep have been shorn in the season at one of these *esquileos*, at Ortigosa, in Segovia*.

The *clipping*, or *shearing* of sheep, is performed in two ways, and usually in a barn, or similar shady place. The first and most antient, or common way, is done longitudinally; this mode is attended with considerable difficulty, and is seldom well executed. The second, and improved method, consists in cutting *circularly* round the body of the animal, the beauty of which is, in consequence of this, believed to be increased, while the work is more uniformly and closely executed.

Previously to the sheep being handed over to the shearer, it is recommended that a person should clip off all coarse and *kempy* wool from the hips, legs, pate, and forehead, and keep it apart from the rest of the wool, in a bag or basket. This is particularly necessary to be observed in the shearing of lambs: for, in lambs' wool, if the coarse part and kemps be suffered to mix with the fine, they never can be sorted out, and must spoil any fabric to which the wool may subsequently be applied, as the kemps will not take any dye; and whatever colour may have been intended, the article must be a mixture. Further, great care should be taken, in shearing, not to give the wool a second cut, which materially injures and wastes the fleece.

During the whole process of washing, as well as of shearing sheep, it will be advisable for the farmer himself to superintend those operations; and especially to see that the clipper does not wound or prick the animal with the edge or point of his shears; otherwise the flies, abounding in the sultry heats of Midsummer, will instantly attack the sheep, and sting them to very madness. The same precautions are applicable to the shearing of lambs, which are usually washed and clipped about

able "Histoire de l'Introduction des Moutons à Laine fine d'Espagne dans les divers Etats de l'Europe, et au Cap de Bonne Espérance", &c. 8vo. 1802.

* Bourgoing: Tableau de l'Espagne Moderne, Vol. I. Ch. III.

five or six weeks after the rest of the flock, though such practice is disapproved by some breeders, who accordingly shear the whole at the same time. And lastly, it will be requisite that he see the wool carefully clipped off, and properly wound up, lest any impure particles or extraneous substances be mingled with the wool, the sale of which might otherwise be injured. For this purpose, the respectable Society above mentioned recommend the fleece, when shorn, to be spread at large with the outside uppermost, upon a platform of boards: it is then to be carefully folded and rolled, beginning at the hinder part, and folding in the sides, or belly wool, as the rolling proceeds. When arrived at the shoulders, the wool of the fore-part is to be rolled back to meet the other, instead of having the binder twisted from thence in the usual manner; and the whole is to be secured by a pack-cord band, in the common way in which parcels are tied up. Thus the fleece is kept much tighter together, and unfolds itself with more regularity under the hand of the sorter, who is otherwise much inconvenienced by the confusion or breaking of those parts of the fleece which, in the common method, are twisted together for the band.

In the preceding details, we have spoken of one annual shearing; but experiments have been made by some enterprising breeders, tending to shew that, in certain cases, long-woolled sheep may be *shorn twice* in the year. The trial, however, has not been attended with any advantage; for although a trifling additional quantity of wool might be thus obtained, it would not be sufficient to pay for the additional trouble and expense: the quality, also, would be inferior in length of staple; and late shearing exposes the sheep to injury from cold. To meet this latter objection it has, indeed, been proposed to clothe them in flannel jackets, as practised by the breeders of the new Leicester rams; but although that may answer the purpose of men who find their interest in supporting a peculiar breed of delicate sheep, it cannot be adopted generally, even if it were advantageous to the animal, of which many strong doubts are entertained. The external air and sun are necessary to the health of the sheep, which seems intended by nature, more than any other domesticated animal, for exposure to the weather. It is also probable that the system of clothing sheep is prejudicial to the growth of the wool both in strength and staple.

Mr. Ellman, of Glynde, clips off the coarsest wool on the thighs and docks of his South-down flock, (the first of that

breed in this island,) about four weeks before the usual time of washing and shearing. The wool, thus severed, he sells as locks; each sheep yielding, upon an average, four ounces. He is said to find this method very beneficial, as the animals are kept clean and cool during hot weather; and from the success with which it was practised, it has been adopted in other counties with different breeds of sheep.

A more singular mode has for some years been tried at the French national farm, at Rambouillet, the result of which is stated to be, that the fleece of sheep improves greatly by being suffered to grow for several years; and that the fleeces of some sheep, which were shorn in 1804, for the first time for *three* years, and in 1814, for the first time for *five* years, were equal, in point of staple, to those which were annually shorn, and produced a larger sum. We state these facts for the consideration of the philosophic breeder; though we confess ourselves at a loss to reconcile them either with the generally received theory of the growth of the fleece*, or with the effect of the very great degree of heat which the French sheep must have felt with such a weight of wool; especially, as it is the opinion of all well-informed breeders, that excessive heat is equally hurtful to sheep as extreme cold. Beside which risk, it may be observed, that he who should in this country attempt such an experiment, would be liable to lose no small portion of the profit to be derived from the fleece, by the latter being torn by hedges, thistles, &c.; unless, indeed, the experiment were conducted in an inclosure expressly made for the purpose; and even then it is more than probable that it would fail.

In this country a custom has been lately introduced, of not, as formerly, shearing the lambs. The wool of the *Hoggets* thus acquires a greater length of staple; and as combing wool now commands a higher price than the carding quality, this is of the utmost importance to the proprietors of short woolled flocks; it is, indeed, the only kind of short British wool that has been, for some time past, saleable, except at prices that are ruinous to the grower.

After sheep have been clipped, it is usual to *mark* them with ochre, tar, ruddle, or other colouring matter; but, as it sometimes becomes difficult to wash the stains of these substances out of the wool, another composition was suggested by the late

* See the following chapter.

Dr. Lewis. It is prepared by mixing finely-pulverized charcoal, or lamp-black, (which is better, where it can be procured,) with such a quantity of tallow, over a moderate fire, as will produce a black colour, and a proper consistence; and, with the view of rendering this preparation more durable, Dr. L. states, that one-fourth, sixth, or eighth part of tar, may be incorporated with the tallow; and that wool, which has been marked with such mixture, may easily be cleansed therefrom, by washing in strong soapsuds.

The inconveniences attendant on the common mode of marking sheep, having already been adverted to, we shall conclude this chapter by briefly noticing a new method suggested by M. Lasteyrie. Horses and other cattle, it is well known, are usually marked on the thigh with a red-hot iron; but this is not practicable on sheep, unless perhaps the iron be applied to the forehead, jaws, or horns of the animal; and even in this case only one common mark can be given to a certain number of sheep. It is, however, essential, that a distinctive mark be given to each animal: with this intention, M. Lasteyrie states, that some breeders on the Continent avail themselves of metallic plates whereon the numbers are engraven, and which they fasten with a piece of pack-thread to the neck, or with a piece of wire to the ears of the animal; but as this method can only be adopted under certain circumstances, and is further liable to many inconveniences, M. Lasteyrie proposes to *make notches* in the ears of sheep, as the most easy and certain expedient.

Where, indeed, a pure, as well as a mixed breed of sheep is reared on the same farm, it will become necessary, in order to avoid mistakes, to distinguish those of the first breed with a different mark from that employed for the sheep of the second breed. In this case, he proposes to apply to the face of the animals an iron, previously made red, and which should be from three to five lines in diameter. Each individual of the flock must next be marked with a number formed by cutting notches in the ears. Two Roman cyphers (viz. I and V) will be sufficient to form a series of numbers from 1 to 199; beyond which number a new series must be commenced, by marking the animals of the second, third, fourth, or other series, with iron tinged with red, and bearing a different impression from that already employed, or by placing such iron on different

parts of the face. Thus the most numerous flocks may be numbered with facility.

The marks are formed by cutting the two Roman cyphers on the upper or lower extremity of the ears; though the last is preferable, as the former better protects those organs from the rain, and other severities of the weather. The right ear will have the units, and the left ear the tens, Number I. to IIII. inclusive will designate as many units: a small portion of the ear must then be taken off in this form, V, to mark No. 5; and the subsequent number, to nine inclusive, may be indicated in the following manner:

No. 6, by	VI.
7, ...	VII.
8, ...	IV.
9, ...	IIV.

The marks, which on the right ear denote *units*, will on the left ear signify a corresponding number of *tens*.

M. Lasteyrie has also proposed another system of numbering sheep; by means of which it would be easy to ascertain by one glance the genealogy of the individuals. Where a farmer then has a flock, from which he is desirous of raising a breed, the animals may be numbered in the manner already indicated; and each new lamb may be marked on one ear with the number of its mother, and on the other with that of its sire. The upper edge or extremity of the ear, would, in this case, serve to designate the units, and the lower the tens. It would further be easy to ascend to the whole series of generations from son to father, by examining the age of each individual from the teeth. This method, M. Lasteyrie thinks, has its advantages, especially where no register is kept of the flock*.

The breeder would, however, find it conducive to his interest to keep a register, in which the numbers of each sheep might be marked: here also should be entered such observations (which ought to be carefully made) as not only related to the coupling and crossing of the breeds, but also those experiments he may wish to try upon the animals. A careful cultivator, who is solicitous to improve his art, will, in such register,

* Histoire de l'Introduction des Moutons à Laine fine d'Espagne, &c. p. 254.

notice the defects, or other qualities of his sheep, their respective states of health or disease, the nature of their wool, the profit they yield, &c. Thus it will be easy to ascertain what individuals it will be proper to dispose of every year, as well as those from which it will be advantageous to breed; and, at length, the object proposed will be obtained, namely, the improvement of the breeds, and deriving from them the greatest possible profit.

CHAPTER IX.

ON FOREIGN AND BRITISH WOOL.

The importance of the woollen manufacture, both to the commercial and labouring classes of this nation, has long been felt; yet it is only within the last forty years that the subject has been scientifically considered, or any efficient measures have been taken in order to improve the quantity and quality of British wool.

As the extent of the present work will not admit of a detailed account of prejudices which are now daily disappearing, we propose, in the present chapter, only to state the essential properties of wool, and concisely to notice the improvements already made, together with those means which experience and reason evince to be the best calculated for that purpose.

The growth of wool is always completed in one year, at the expiration of which it spontaneously decays, and is naturally renewed. In this respect, indeed, the covering of sheep bears a close resemblance to the hair of most other animals; though it differs widely in the following particulars: wool is considerably finer, grows more uniformly, each filament growing at equal distances, and separating nearly at the same time from the skin; and, if not shorn in time, naturally falling off, being succeeded annually by a short coat of young wool. Another peculiarity in wool is, the different degree of thickness which prevails in various parts of the same sheep, being closer at the extremities or points than at the roots, and the part that

grows during the winter being of a much finer quality than that produced in the summer.

Various are the names given to wool, according to its state or relative degree of fineness. When first shorn, it is termed a *fleece;* and every fleece is usually divided into three kinds, viz. the *prime,* or *mother-wool,* which is separated from the neck and back; the *seconds,* or that obtained from the tails and legs; and the *thirds,* which is taken from the breast and beneath the belly. This general classification of wool corresponds with the Spanish method of sorting into *Rafinos,* or prime; *Finos,* or second best; and *Terceras,* third, or inferior sort: but the intelligent wool-staplers in the eastern part of this island, distinguish not less than *nine* different sorts that are broken out of small fleeces, the names given to which prove the nice discernment of the persons employed; we therefore subjoin them for the information of our less informed readers.

No. 1. Is *Short-coarse,* and very descriptive of its character.

2. *Livery,* } old sorts, into which the fleece was formerly di-
3. *Abb,* } vided.

4. *Second.*—Probably a second or better *abb,* and the first alteration in the mode of sorting; which arose either from the improvement of fleeces, or in the art of breaking them. This, and all the subsequent names, seem to have been in their regular succession at the top of the list.

5. *Downrights.*—Perhaps intended to convey the idea of superlative perfection.

6. *Head,* or *chief.*

7. *Super-head.*—An advance upon the preceding sort.

8. *Picked Lock.*—First made, perhaps, in small quantities.

9. *Choice Lock.*—Still more excellent.

Beside these sorts there is another recently introduced into the list, and called *Prime Lock;* which, as its name indicates, is the finest possible that can be obtained.

Till within a few years, the finest wool manufactured in this country was obtained exclusively from Spain, and next to Spanish wool, the English sheep, at that period, indisputably furnished the best commodity of the kind in Europe. Previously to the introduction of Spanish sheep, the finest and most esteemed sorts of British wool were the Mendip, Ryeland,

South-down, Wiltshire, Shetland, and Cheviot fleeces: but by the judicious crossing of Merino rams with the choice British sheep, particularly of the Ryeland Breed, wool even of the *fourth descent* has been obtained, which, in point of fineness and texture, has proved *nearly equal to the best Spanish.* For this improvement, at that time deemed of the highest importance to its agriculture and manufactures, the British nation was indebted to the patriotic exertions of Lord Somerville, of the British Wool Society, the Board of Agriculture, and Dr. Parry of Bath *. With the same noble views, his late Majesty, for many years previous to his illness, annually permitted some of his Spanish sheep to be sold at reasonable prices, under the auspices of Sir Joseph Banks; and, in many instances, allowed them to be used gratuitously.

The expectations thus raised have, however, been disappointed; and the momentary advantage that was gained by these crosses, has been wholly destroyed by the superior quality of the German wools, and the low prices at which they are now imported. The whole evidence before the Committee of the House of Lords, appointed, in 1828, to inquire into the state of the wool trade, goes to prove, that the wools of Bohemia and Saxony have entirely superseded the British short wool in the greater part of our cloth manufacture; and the consequence has been, that the value of the latter has fallen below a remunerating price to the grower. To this alarming fact is to be added that of the rapid increase of the fine-wooled flocks in New South Wales, which bid fair, at no very remote period, to supply the whole demand of this country.

We shall now proceed to state some of the principal requi-

* The details of the various experiments, conducted by the different public-spirited individuals above named, being too numerous for insertion, a few only of their general results can be given. Such of our readers as possess ability, leisure, and inclination to observe the gradual progress that has been made in this national object, will be amply compensated by a perusal of Lord Somerville's "System, followed by the Board of Agriculture," &c. 8vo. 1800; also his Lordship's "Facts and Observations on Sheep," &c. 8vo. 1803; the second volume of "Communications to the Board of Agriculture;" Dr. Parry's "Facts and Observations on the practicability of producing British Clothing Wool equal to that of Spain;" and the ninth Volume of the "Letters and Papers of the Bath and West of England Society."

sites, which are indispensably necessary to constitute good wool. These are:—

1. The *length of the staple;* for this regulates the various fabrics to which the fleece is destined. Thus, in carding wool, a *short pile*, and a disposition to assume a crumpled, or spring-like shape, is an object of prime importance. This shrivelling quality, Mr. Luccock remarks *, cannot prevail in too high a degree, if it be to make cloths requiring a close and smooth surface: but for cloths where a long and even nap is required, too large a proportion of this curling property he conceives would be detrimental; and consequently a *long* pile or staple will be preferable. Hence, it will be obvious to every attentive cultivator, that wool must be grown for particular purposes, according to the nature of the manufactures carried on in his vicinity. There is, however, a certain point, beyond which, if the crumpling quality proceeds, the wool becomes less valuable, on account of the superior length of the curves, which render it difficult to break the staple sufficiently. The distribution of the hairs in this staple has been compared to that of the grain in a very crooked piece of timber, or to waved bars of metal, so formed that the convex part of one fits into the concavity of another. As this peculiar property cannot be communicated to wool where it does not naturally exist, breeders of sheep will find it essential to their own interests to unite the valuable properties of wool with those of the carcass.

2. Pliability of wool is another important quality to which the attention of the grower should be directed; as, without this elasticity, it will be unfit for the purposes of manufacture.

3. The peculiar quality, termed the *felting quality* †, is of equal importance with the preceding; and, though not evident to the eye, is in fact indispensably requisite in all wools which are wrought up into such cloths as are submitted to the action of the fulling-mill. Mr. Luccock describes it as "a tendency in the pile, when submitted to a moderate heat, combined with moisture, to cohere together, and form a compact and pliable substance." This valuable property is possessed in a high degree by the Spanish sheep; and, according to Mr. Luccock's

* In his valuable treatise on "The Nature and Properties of Wool," p. 147.

† Treatise on Wool, p. 161.

opinion, the Cheviot, Morf, and Norfolk fleeces are best adapted for the purposes of fulling.

4. A soft pile is also an essential requisite to constitute a good fleece. In this, as well as in the other properties already enumerated, the Saxon wool peculiarly excels; and among the British fleeces, those of Shetland stand unrivalled in this respect.

5. The specific gravity, or relative weight of the pile is a quality to which the attention of wool-growers has not yet been directed so particularly as the subject requires. In order to ascertain the comparative weight of different samples, Mr. Luccock directs each of them to be brought as nearly as possible to the same degree of purity, to expel all the moisture which wool obstinately retains, and extract all the air contained in the interstices of the staple *.

6. The smell of wool is not a property to which much weight can attach: provided no disagreeable odours are emitted, or any of the effects of moisture are exhibited, Mr. Luccock considers no one scent to be preferable to another. It is, however, essential that wool should, as far as possible, be perfectly *white*.

7. The last property to which the attention of the cultivators of wool should be directed, is trueness of hair, or a uniform regularity of pile, in which no coarse, shaggy hairs are perceptible; as the latter, by reason of their brittle nature, will very materially affect the progress of the manufacturer. Such coarse hairs, as well as kemps or stichel hairs, (which are generally short, brittle, pointed, opaque, and of a gray or brownish cast,) are found principally in neglected breeds. Since, however, the art of combining the properties of the parent sheep in their offspring has been generally known, the expert cultivator of wool has been enabled to produce surprising alterations in the relative weight and fineness of the fleece.

In countries where wool is the chief object in the breeding and management of sheep, every other consideration is sacrificed to its improvement; but in England, the carcass is generally of greater importance than the fleece, and weight of mutton has of late years been more attended to than fineness of wool. In this, the farmer has doubtless found his account; but

* Treatise on Wool, p. 175.

they are objects which cannot be combined with equal advantage to both; and the consequence has been, that while the size of the principal breeds of our short-woolled sheep, and the weight of the fleece have been gradually increased, a proportionate deterioration has been occasioned in the quality of the wool. The fact has, indeed, been denied by the breeders; but evidence, entitled to so much confidence as to be apparently conclusive, has been produced before the Committee of the House of Lords, already alluded to, establishing it, generally, beyond the possibility of doubt; as will fully appear from the following tables, selected from the evidence of many eminent wool dealers and manufacturers, and extracted from the Minutes:—

PARTICULARS OF SOUTH DOWN WOOLS

Assorted by W. and J. CUNNINGTON, Upavon, near Pewsey, Wilts.

	List.	Warp.	Abb.	Down^{ds}.	Head.	Super.	Choice.	Prime.	Pick.
DEVENISH:									
1823 ..... 3,974 Ro	110	209	353	369	658	611	800	848	16
1827 ..... 3,754 R	96	93	397	374	758	956	636	444	—
DOWDEN, &c.									
1823 ..... 2,874 Ro	92	137	215	190	427	345	400	967	101
1827 ..... 2,705 ×	60	182	255	186	513	622	473	421	48
WHITCHURCH:									
1824 ..... 10,405 Rb	433	495	1,099	1,178	2,030	1,647	1,644	1,799	80
1827 ..... 10,550 N	366	358	1,179	1,036	2,599	2,756	1,552	687	17
WANSBRO':									
1815 ..... 1,006 ϕ|	5	70	43	20	36	77	197	498	60
1827 ..... 1,419 ×	10	70	110	90	247	293	310	289	none.
SAFE:									
1815 ..... 932 ϕ|	6	59	29	16	19	41	207	497	58
1827 ..... 1,326 ×	20	50	107	85	200	256	358	246	4
TUCKWELL:									
1815 ..... 28,492 ϕ	38	242	130	67	88	271	719	1,244	50
1827 2,787	48	150	238	220	463	486	544	638	none.
DEAN:									
1815 ..... 2,478 21	21	209	95	69	91	193	465	1,253	82
1827 ..... 2,611 N	64	115	190	200	384	399	444	786	29
POWELL:									
1815 ..... 1,750 ϕ|	7	112	64	40	67	148	347	875	90
1827 ..... 2,184 ×	52	55	218	94	376	273	411	705	none.

A STATEMENT, showing the COMPARATIVE WEIGHT of the different Sorts produced from (15 tods) 420 pounds of Clothing Wool grown in Norfolk, by MR. JAMES FISON, Wool-dealer, of Thetford, Norfolk.

	1793.	1808 and 1809.	1818 and 1819.	1827 and 1828.	Prices of Sorts in 1828.
	lbs.	lbs.	lbs.	lbs.	s. d.
Prime	200	144	56	14	1 8 per lb.
Choice and Choice Grey	96	80	48	24	1 0 ..
Super and Middle Grey	64	80	96	56	0 10½ ..
Head, Downright, and Third Grey	52	104	168	152	Head 0 10 .. Downrights 0 9½ .. Third Grey 0 8 ..
Seconds, &c. included in 1793, 1808, and 1809:					
Seconds	..	..	20	80	0 9 ..
Abb	..	..	10	48	0 7½ ..
Britch, &c.	..	..	2	6	0 5 ..
Livery	..	..	8	24	0 6¼ ..
Waste	8	12	12	16	
	420	420	420	420	

Calculating the weight of sorts produced at each of the above-named periods at the present prices of sorts, the result will show, that if our clothing wool were equal in quality—

To the growth of 1793 ..... it would now make 12½d. per lb.
If equal to the growth of 1808 and 1809 ..... 11½d. ..
If equal to the growth of 1818 and 1819 ..... 10½d. ..
Actual value in 1827 and 1828 ..... 8½d. ..

It thus appears that the difference in quality between 1793 and 1827 is equal to 8½d. per pound.

Although these tables only apply to particular districts, yet they corroborate the unanimous assertion of the manufacturers, that British short wool has generally degenerated in quality, while the increase of weight also appears from the following account, produced by Mr. C. Bull, woolstapler, of Lewes:—

STATEMENT

OF THE

RESPECTIVE WEIGHTS OF FIVE TODS OF WOOL,

The Produce of different Farms, at different periods, between the Years 1803 and 1827, inclusive.

Average of	Year.	Number of Fleeces.	Tods of 32 lbs.		Fleeces per Todd.
			Tods.	*lbs.*	
Produce, No. 1	1803	869	58	7	15
Ditto	1804	864	50	28	17¼
Ditto	1806	923	65	24	14
Ditto	1807	808	68	26	11¾
Ditto	1815	866	57	14	15
Ditto	1816	875	67		13
Ditto	1817	915	75	12	12
Ditto	1825	778	63	8	12¼
Ditto	1826	835	72		11½
Ditto	1827	824	69	4	11¾
Produce, No. 2	1804	1,191	75	5	15¾
Ditto	1805	1,227	89	10	13¾
Ditto	1806	1,165	90	22	12¾
Ditto	1807	1,248	105	18	11¾
Ditto	1808	1,338	105	10	12¼
Ditto	1822	1,348	125	20	10¾
Ditto	1826	1,189	105	17	11¼
Produce, No. 3.....	1804	658	40	14	16¼
Ditto	1805	574	45		12¾
Ditto	1806	572	42	16	13½
Ditto	1807	551	41	13	13¼
Ditto	1808	650	45	18	14¼
Ditto	1822	655	58	11	11¼
Produce, No. 4	1804	1,306	83		15¾
Ditto	1814	1,370	110	29	12¼
Ditto	1815	1,350	104		12¾
Ditto	1826	1,160	106	14	11
Ditto	1827	1,210	115	3	10½
Produce, No. 5	1806	1,209	87	22	13¾
Ditto	1822	1,195	96	23	12¾
Ditto	1823	1,147	96	7	12

There are still, no doubt, some Down-land flocks, in which the original quality of the wool has been sustained *; and others in which it has been even improved by crosses with foreign sheep; but, wherever the now almost universal system of feeding on artificial grasses and roots, and fattening at an early age, has been introduced, the deterioration is, with very few exceptions, evident. It is therefore clear, that high feeding is incompatible with the production of fine wool; and the farmer will henceforward find it most prudent to make his election of the breed he means to adopt, with a view to one object alone. That this has been already done, to a very great extent, appears from the large increase which is supposed to have been made within the last thirty years, in the heavy long-woolled sheep, while the lighter carcassed short-woolled breeds have diminished.

According to Mr. Luccock's tables, published in 1805, and to the calculations of the wool Committee at Leeds, presented to the House of Lords in 1828, the number of Packs of wool of the several qualities at the respective periods, have been estimated as follows:

1800,	short-wool...	193,475	1800,	long-wool...	131,794
1828,	ditto.....	120,655	1828,	ditto.....	263,847
	Decrease..	72,820		Increase..	132,053

The preference which thus appears to have been given to the long-woolled breeds, has not, however, wholly arisen from the superior profit to be obtained from the carcass; but from British short wool having been to a great extent thrown out of our cloth manufactures, while an increased demand has arisen for the combing quality. The relative value of the fleece has thus changed: both the wool and the carcass of the heavy sheep, now severally produce the most money; and it has therefore become the interest of the farmer to breed them whenever his land will allow it.

It is impossible to read the evidence produced before the Committee of the House of Lords, without being convinced, that even if the quantity of British wool had not degenerated, it would still have been superseded by the superior value of the

* The evidence of Mr. Ellman, of Glynde, is to that effect; and shews also that the weight of fleece of his own flock has diminished about six ounces since 1817.

foreign wool for most manufacturing purposes. The softness and felting properties of the latter, are stated by the concurrent testimony of all the manufacturers who were examined, to be of such advantage in making fine cloth, that it would still continue to be used, even if the duty, which was lately repealed, were continued. Nothing, in short, but an absolute prohibition, can prevent its consumption; while the effect of that, or even of a continuation of the former duty, would unquestionably be to deprive us of the export trade. It appears, also, that by the admission of foreign wool into our manufactures, much of the British growth is brought into use by being mixed with it. Under these circumstances, it is hardly to be expected that the legislature will impose any further impediment to the importation of the foreign wool; and a dispassionate review of them must render it more than doubtful, whether even were the prayer of the wool-growers granted, it would afford them the desired relief.

The quantity of foreign wool consumed in our manufactories, is supposed to be about 25,000,000 lbs. annually; of which the greater proportion is German; yet the importations are stated to consist principally of inferior and middling descriptions, though there can be little doubt that the best qualities grown, are sent to the English market. The proportions, if divided into parts, and the current value in 1828, were stated to the Committee of the House of Lords, as follows:—

		s.	*d.*		*s.*	*d.*
Saxon wool, 20 parts	2 from	6	6	to 7		6
	6	3	6	.. 4		6
	6	2	3	.. 2		6
	6	1	8	.. 2		6
Austrian, or Bohemian wool, 30 parts	5 from	4	6	to 6		6
	10	2	3	.. 2		9
	15	1	6	.. 2		0

And the general average was calculated at *2s.* 4*d.* per pound.

Spanish wool is imported in about equal proportions; and that from New South Wales is considered to average 9*d.* to 1*s.* 6*d.* for three fourths, and the remainder from 1*s.* 6*d.* to 2*s.* 6*d.* per lb.*

* Minutes of Evidence, &c. p. 279.

The quantity of each of the above kinds, imported in the year 1827, was as follows:—

	lbs.
German	21,220,788
Spanish	3,898,006
Australian	512,758

And from Russia, and various other countries, different parcels, amounting altogether to 29,122,447 lbs.

The above importation from New South Wales, appears of very trifling importance; but it amounted to more than double that quantity in the preceding year; and the breeders in that country are making rapid strides both in the increase of their flocks, and in the improvement of the fleece. The Australian Agricultural Company are already in possession of 12,000 fine-woolled sheep; the Van Dieman's Land Company are making similar exertions; and many individuals of enterprise and capital have embarked in the speculation of growing wool for the supply of the English market. The wool produced in that climate, acquires a remarkable degree of softness, superior to that of any other kind. This has been proved by the comparison of fleeces shorn in England, from sheep which were afterwards sent out to New South Wales, with fleeces from the same sheep, shorn twelve months after their arrival, and sent here to ascertain the fact; and cloth of the finest quality that has ever been manufactured in this country has already been made from it *.

With such advantages, and with an unlimited range of pasturage, to an unknown extent, it is no extravagant speculation to calculate that, at no very distant period, we shall receive our largest supplies of fine wool from those settlements.

CHAPTER X.

ON THE IMPROVEMENT OF BRITISH WOOL.

In describing the fleeces of this country, Mr. Luccock disposes them in two classes, which are mutually distinguished

* Minutes of Evidence, &c. *passim*.

by the length of the staple and the mode of manufacturing them; the one being suited to the fabrication of worsteds, and the other to the making of woollen goods. The sheep from which these different kinds of staple are obtained, do not always run promiscuously in the same flock, or graze upon the same pastures; each being most commonly found upon its appropriated soil, and under a peculiar management. Sometimes the line which separates them is boldly drawn; at others the pastures are so mingled, or the qualities of the land so gradually change from those which are suitable to the heavier sheep, as to give the stock a sort of mongrel appearance, and the fleece an uncertain character. But human genius, always fertile in expedients, has rendered even this defect of the fleece advantageous to the interests of society; and has adapted to it the manufacture of stockings.

Thus, although long wool is found in many detached parts of England, it is much more common on the eastern than on the western side, and often nearer to the coast than the middle of the kingdom. Sometimes it is produced upon a few acres which are surrounded by land of a different description, and grazed by sheep of another character; these tracts, being too small to deserve general attention, will be passed unnoticed, and the wool included in the common produce of the district where it grows. Among the larger ranges of long-woolled sheep, the first to be noticed, and the most northern, is situated near to the mouth of the Tees, a river separating the bishopric of Durham from the county of York. The second, which may properly be denominated the Lincoln district, comprehends the south-eastern point of Yorkshire, nearly the whole of Lincolnshire, and the fen lands of Huntingdon, Cambridge, and Norfolk. This kind of wool is found in the smaller marshes of Essex and of Kent which surround the inlets of the sea, but is much more abundant in those of Romney and of Guilford. We meet with it in the counties of Dorset, Devon, and Cornwall, upon the Cotswold-hills, in some detached parts of Lancashire, Oxford, Bedford, and Stafford, through the whole of Leicester, Rutland, Northampton, and Huntingdon, and along the banks of the larger rivers.

But it is remarked by Mr. Luccock, that the short wools of the kingdom do not arrange themselves so distinctly in districts as those of a longer staple do, but fill up the whole space be-

sides that which has been noticed as the pasture of the heavier breeds of sheep. Those families which produce a fleece suitable to the card, though originally possessing features much more strongly characteristic than are found in the other kind, are sometimes so mingled with each other, and with the sheep of the larger fleece, as to render it difficult to determine what particular race many of the individuals belong to. Yet it will be found most convenient to describe them in classes, and to proceed from that county where the species appears most pure, to those where its blood becomes intimately mingled with that of another variety. We know not the period when any of these sheep were introduced into the country, nor whence they were procured, but there remain at present in England and Wales, six different kinds of them, viz. the Norfolk, the South-Down, the Wiltshire, the Ryeland, the Heath sheep, and the Mountaineer; besides some small collections of different varieties, which seem to have descended from families now almost extinct *.

Only two modes, says Mr. Luccock, have yet been adopted for the improvement of fleeces. "One consists in selecting those lambs for slaughter which have the least valuable coat; the other, in bringing into the flock male sheep of the most approved breeds, in order that their progeny may perpetuate their best peculiarities."† It is in fact by the judicious crossing of different breeds with Spanish sheep, that so much has been done towards the amelioration of British wool; and, since this subject has been very ably treated by a neighbouring practical writer ‡, we have selected the following important principles, founded on actual experience, for the consideration of all judicious wool growers. They refer, indeed, solely to the improvement of short, or carding wool; but the judicious breeder will readily perceive that they may be equally applied to long-woolled sheep; and a consideration of the facts already recorded must evince the strong probability, that the latter breed will henceforward command superior attention.

1. Every person, who is desirous of having a fine-woolled flock, must select the finest rams that can possibly be ob-

* Treatise on Wool, p. 137.

† Ibid. p. 350.

‡ Mr. Fink's Treatise on the "Rearing of Sheep in Germany, and the Improvement of coarse Wool," published (in German) at Halle, 1799.

tained, particularly at the commencement of his undertaking, i. e. for the first generation: for, if the ram for the second race is finer than that employed for the first, it is evident that time has been lost in effecting the proposed improvement.

2. In like manner, the finer woolled the ewe is with which the improvement commences, so much the more rapidly will that of the breed arrive at the degree of superfine.

3. The greatest attention is requisite that the rams employed for the subsequent breeds be as fine as the first; otherwise the amelioration will be retarded.

4. Where a breeder is desirous of stopping at a certain degree of fineness, without proceeding any further, he may easily effect this object. It will in such case be sufficient to take a ram and ewe of the first or second race; he will have one half or three-fourths fine; and his flock will retain this degree of fineness without any additional improvement.

5. Unless the breeder be minutely attentive to the selection of his rams, the produce of his embraces will have only one-fourth part of the Spanish fineness.

6. If an unimproved ewe be put to a ram of a mixed breed, and which has only one-fourth part Spanish in him, the offspring will only have one-eighth Spanish: by continuing to propagate in this manner, a complete separation of the two breeds will at length be effected.

But Mr. Luccock is of opinion, that flocks might be amended much more rapidly, if, in addition to the common methods above detailed, a kind of barter in lambs were adopted between two neighbouring districts, one of them possessing a superior, and the other an inferior breed of sheep. If these could be exchanged in such a manner that the inferior sorts only should be sent to the markets, while the good ones were preserved, he affirms that the British flocks would annually become more valuable; as a few seasons would be fully sufficient to dispossess the least cultivated breeds of their present pastures. Our limits do not allow us to notice the objections which he conjectures may be made to this proposal; but, as it is evidently the result of much reflection and experience, we leave it to the consideration of the attentive reader.

Mr. Bakewell, however, has brought forward some facts and

observations, which render it probable that the fineness of wool depends upon the *difference of soil**. Having, early on his introduction into the wool business, noticed a remarkable difference in the softness of wools equally fine, but which were produced in different districts, Mr. B. was led to believe "that the herbage of each district derived from the difference of soil some peculiar properties, which gave to it, as the food of sheep, the power of effecting that process of the animal economy by which wool is produced.

"The soils more favourable to this soft quality were, first, the argillaceous; next, the siliceous; and it was well known, that calcareous soils, whether limestone or chalk, produce wools of a contrary quality, remarkable for their harshness to the touch. In proportion as the above earths preponderate in a loose state near the surface of different soils, their effects may be detected, whatever be the breed of sheep from which the wool be shorn." †

These remarks on the effects of chalk upon wool, are limited to chalk alone, by Lord Somerville, who considers them as inapplicable to limestone soils in general. "Lime," his lordship observes, "certainly may be burnt from chalk as well as from the limestone: as chalk, it is conveyed into the fleece by contact in its natural state; but limestone, if it does not lie deep below the surface, as is usually the case, is a hard and clean stone, and can communicate nothing to the wool until it is rendered into lime by the strongest effect of fire. This doctrine militates also against the whole of our practice in the western counties. The pile of all my Merino wool, even of the pure blood, is publicly admitted to be improved; it has been constantly grown on a limestone soil, and the surface of the land manured with lime in each course of cropping, and to the extent of 100 bushels per acre of the best popple-lime, the quality of which has been ascertained by Sir Humphrey Davy, to whom specimens were sent; it has been treated on in his public lectures, and its quality ranks among the strongest of our manuring lime. As the author speaks so positively on the effect of lime-

* "*Observations on the Influence of Soil and Climate upon Wool*," &c. 8vo. 1808.—The value of this work is considerably augmented by several important notes communicated to the author by the Rt. Hon. Lord Somerville.

† Bakewell on Wool, p. 5.

stone on wools, we may conclude that the limestone of Derbyshire and the adjoining counties does produce this effect."

Mr. Bakewell conceives that the *soft quality* of wool may be preserved in every situation by *greasing the sheep;* and that the same means will also contribute to counteract the effects of climate and soil, where these are unfavourable to this quality; and further, that sheep will thereby be preserved from cutaneous distempers, from the change of climate, and from the sudden change of temperature after shearing. Mr. B. strenuously advocates the practice of greasing sheep, proving its antiquity as well as its usefulness by details of facts, for which we reluctantly refer to his work, as this article would otherwise be extended beyond our confined limits. The result of his practice, however, may be comprised in the following positions, distinct from the recital of facts by which they are supported. Mr. B. infers,

1st. THAT hair differs from wool, by the greater degree of hardness and elasticity of its fibres.

2d. That some wools resemble hair in this quality more than other wools which are much coarser.

3d. That the hard quality found in some wool, prevents it from making cloth of the same value as the softer wools, if the former are considerably finer than the latter.

4th. That the application of unctuous matter sufficiently soft and tenacious to cover and remain upon the fleece, will defend it from the action of the soil, and is found to produce the soft quality of wool, so desirable to the manufacturer.

Hence the greased wools of Northumberland and Yorkshire possess a superior degree of softness to any ungreased wools in the kingdom.

Hence sheep that have received the benefit of this practice, and are driven into other counties not remarkable for soft wools, still preserve the distinguishing softness of their fleece. Hence we learn the reason why ointments, when casually employed to cure some disease of the animal, have also generally been found beneficial to the wool.

If these facts and inferences be admitted, we may also infer, that an improved method of greasing fine-woolled sheep should be adopted in every part of the kingdom, and that it would greatly improve the quality of the wool, and annually save

many thousand sheep from perishing by the severity of the weather *.

It has been recommended to besmear the roots of the wool, immediately after the sheep are shorn, with an ointment composed of butter and sulphur, which is to remain on the sheep for three or four days; at the end of which time they are to be washed in salt and water. The advantages stated to result from this practice are—a considerable improvement in the softness and fineness of the quality, and also an increase in the quantity of wool produced; besides which the unguent operates as a coat to the animals, and thus prevents them from taking cold immediately after shearing; and also destroys the insects with which they are sometimes infested: a simple washing over with tobacco water will, however, answer the latter purpose.

Too free a use of greasy substances occasions the fleece to imbibe dirt; and although they may not injure the quality of the wool, yet the difficulty of cleansing it materially lessens its price. The opinion that it is of advantage to the growth of the wool may even not be incorrect; but it is deteriorated, in a greater proportion than its increased weight, in the eye of the wool-stapler, in consequence of the additional waste and trouble thus occasioned in preparing it for the manufacturer †. Were these objections removed by a proper system of thorough cleansing, and by the use of substances less noxious than fish-oil and tar, it is, however, not improbable that much benefit might be obtained by carefully greasing the pelt after shearing, both in immediate protection from the fly, and in the ultimate improvement of the fleece.

* Bakewell on Wool, p. 63.

† See the evidence of Mr. Thomas Cook, of Dewsbury, before the Committee of the House of Lords on the Wool trade, in 1828, and the table of comparative prices exhibited by him; from which it appears that Highland laid, or tarred wool is twenty per cent. less in value that when it is left in its native state.

BOOK THE FIFTH.

ON THE BREEDING, REARING, AND FATTENING OF SWINE.

CHAPTER I.

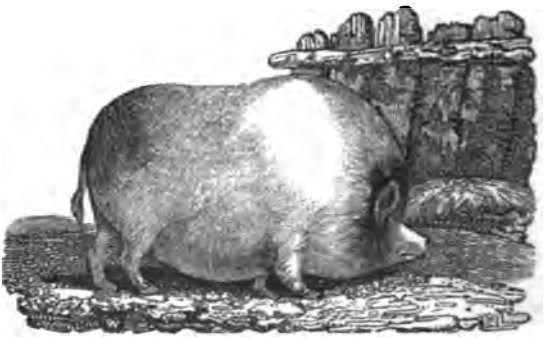
INTRODUCTORY AND COMPARATIVE VIEW OF DIFFERENT BREEDS OF SWINE.

Among the various articles of live stock, few are more profitable to the breeder than *swine*, while the number kept on a farm is proportioned to the quantity of offal on the premises; especially as the attendance they require is, when compared with that of others, very trifling, and the benefit arising from their dung more than counterbalances the expense of such attendance. It is only of late years, however, that the prejudices against these animals have been done away in Scotland, and the counties bordering on England; but they are now both profitably and successfully reared in those districts.

The characteristic marks of a good hog are, a moderate length, as to the carcass in general; the head and cheek being plump and full, and the neck thick and short; bone fine; quarters full; the carcass thick and full; his bristly hide fine and thin; the symmetry or proportion of the whole well adapted to the respective breeds or varieties; and above all, a *kindly* disposition to fatten early.

On account of the numerous sorts and varieties of these

animals, found in almost every country, it is scarcely possible to ascertain which are the original breeds; under this head, therefore, but little more can be attempted than a brief notice of those most generally esteemed, and known under the following denominations:—



1. The CHINESE BREED, of the general appearance of which the above is a tolerably correct delineation, when fat, were originally obtained, as their name imports, from China. Of these there are two nearly distinct kinds: the *white*, and the *black*; both are small; and, although of an extraordinary disposition to fatten, will seldom arrive to a greater weight than sixteen or eighteen stone of fourteen pounds, at two years of age. The former are better shaped than the latter; but they are less hardy, and less prolific. They are both very small limbed; round in the carcass; thin skinned, and fine bristled; and have the head so bedded in the neck, that when quite fat, the end only of the snout is perceptible. They are tender and difficult to rear, and the sows are bad nurses; yet, from their early aptitude to fatten, they are in great esteem with those who only rear young porkers. Their flesh is rather too delicate for bacon; it is also deficient in lean; and their hind quarters being small, in proportion to the body, they cut up to disadvantage: they, however, possess the valuable properties of being very thrifty, and of fattening on a comparatively small quantity of food.

There is also a *mixed breed* of this kind, being white variously patched with black; some of which have prick ears, like the true breed, which they otherwise resemble in form, and others have the ears round at the ends, and hanging downwards.

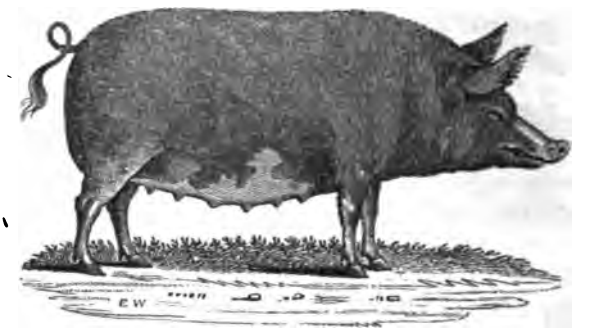
These last are in every respect coarser than the former; but they are remarkably prolific; are good nurses, and, with proper care, will bring up two litters within the year. They are, however, only valuable as breeding sows and roasters; for they are very indifferent store pigs, rarely attaining any great weight, and infinitely more difficult to fatten than the original stock.

II. The animals from which the above figures were drawn, were bred by the late Sir William Curtis, and were exhibited at Lord Somerville's cattle shew, in 1807, where they attracted universal admiration. They were of the BERKSHIRE BREED; the specific characters of which are a reddish colour with brown or black spots; sides very broad; body thick, close, and well formed; short legs; the head well placed, and the ears large, and generally standing forward; but sometimes pendant over the eyes. Another distinctive mark of this breed is, that the best are without bristles; their hair is long and curly; and from its rough appearance, seems to indicate coarse skin and flesh; but in fact, both are fine; and the bacon is of very superior quality. The hogs arrive at a very large size, and have been reared even to the weight of 113 stone of eight pounds *.

Although generally termed the Berkshire breed, and having probably been originally reared in that county, yet they are now dispersed over the whole kingdom; and some of the best are bred in the neighbourhood of Tamworth, in Staffordshire, from the progeny of an animal well known to pig-breeders by the name of the *Tamworth boar*.

* See the Agricultural Survey of Sussex; in which two similar instances are recorded, p. 383: and Parkinson on Live Stock, Vol. II. p. 239.

The crosses from this breed are too numerous to be now distinguished, and any attempt to particularize them would be unavailing. Almost every county has its peculiar kind, the superiority of which is maintained in its own district, and disputed in every other. They have been repeatedly crossed with the Chinese; and a race has been thus obtained, which possesses some excellent properties, and is known in some districts as the *Tonkey breed.*



III. The ESSEX HALF BLACK pigs,—of a sow of which kind belonging to Mr. Western, of Felix Hall, the above is a portrait, —are apparently descended from the Berkshire stock, and may be reckoned among the finest breeds in this country. They are black and white, short haired, fine skinned, smaller heads and ears than the Berkshire; but the latter are feathered with inside hair, which is a distinctive mark of both; short, snubby noses, very fine bone, broad and deep in the belly, full in the hind quarters, but light in the bone and offal; the sows are good breeders, and bring litters from eight to twelve; but they also have the character of being bad nurses.

Mr. Western describes them, as feeding remarkably quick, growing fast, and being of an excellent quality of meat; and he considers them at least equal, upon a fair comparison of age, food, and weight, to any other sort whatever *.

Mr. Western has the credit of having originally introduced this breed, which has now justly acquired great celebrity. It has, however, been claimed by Mr. Waltham, of Maldon, and Mr. Knight, of Ramsden Crays, both eminent farmers. But

* Young's Agricultural Survey of Essex, Vol. II. p. 341.

the fact, as Mr. Young conjectures, appears to be "that since Mr. W.'s pigs have become so famous, those of whom he ever bought any are ready to claim their share."*

The *Sussex Breed* is either a variety of the Essex, just described, or, as some assert, the original stock. It is smaller than the Berkshire, and of very handsome form, the general size, when full grown, seldom exceeding eighteen or twenty stone of fourteen pounds. The bone is not particularly small, but it is clean; the animal is of a kindly disposition to fatten, and arrives at maturity sooner than any other kind.

The *Dishley Breed*, which were at one time as celebrated as all the other kinds of Mr. Bakewell's stock, are remarkably fine boned and delicate, and are supposed to be partly descended from crosses of the Berkshire and Chinese. They were certainly carried to great perfection, and have reached to considerable weight in a very small compass, being, when fat, nearly equal in height, length, and thickness; their bellies nearly touching the ground, and their eyes scarcely to be seen for fat: the whole carcass appearing a solid mass of flesh †.

The form of these pigs possesses considerable beauty, and is well calculated to lay on a large quantity of meat, compared with their bone and offal. They also keep themselves in good condition on a moderate quantity of food, and are easily fattened.

Such are their general characteristics; but to these merits, there are said to be opposed very considerable defects. They have been found slow of growth, tender constitutioned, and to require proportionably more food in fattening than the larger breeds ‡. It should, however, be remarked, that the experiment upon which the latter assertion is founded, was made by feeding *two* Dishley hogs against *one* from a cross between a Berkshire and a large white Shropshire hog; and that while the

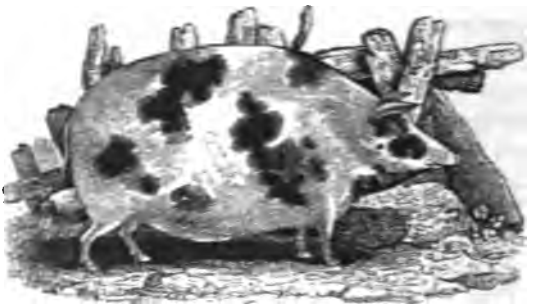
* Young's Agricultural Survey of Essex, Vol. II. p. 345.

† See the Agricultural Survey of Leicestershire, p. 295. The measurement of two pigs of this breed was as follows:—

A Boar used for stock.			A Hog not quite fat, but estimated at thirty stone.		
Length from nose to rump	5 ft.	4 in.	Length from nose to rump	5 ft.	0 in.
Girth round the shoulders	5	4	Girth round the belly....	6	9
Thickness at do.	1	8			

‡ Communication from R. P. Knight, Esq. see the Agricultural Survey of Herefordshire, p. 135.

Dishleys consumed *jointly* the most food, the other weighed *singly* more than the two. This, however, is not alone decisive of their respective merits; which could only be accurately ascertained by a reference to the butcher; as a material difference would no doubt arise in favour of the sale of two small animals, when opposed to that of a single large one.



IV. The WOBURN BREED, of which the animal portrayed above was exhibited at Lord Somerville's Cattle Shew, in 1806. —is a new variety introduced by the Duke of Bedford. They are of various colours, well-formed, hardy, very prolific, kindly disposed to fatten, and have attained to nearly twice the weight of some other hogs within the same given period of time.

Besides these, there are:—

The *Hampshire*, the specific characters of which are—colour chiefly white; neck and carcass long, and the body not so well formed as the Berkshire pigs; but they fatten kindly to a very great size and weight, and make excellent bacon.

The *Northampton*, which are also white, with very short legs, ears enormously large, often sweeping the ground; size large, with coarse bone and hair, and many bristles. They fatten to a great size, but not very kindly, and are reared chiefly in the county of Northampton.

The *Shropshire*, which appear to be a variety of the Northampton race, to whose characteristics they bear a great resemblance; fattening to a large size, but not so kindly disposed as the Berkshire; yet they are both favourites with the distillers, who seem to require a coarse, heavy pig to consume their wash and grains with advantage.

The *Yorkshire*, which are similar in colour to the Berkshire,

but with longer ears, and coarser hair. They have long legs, flat sides, and are coarse in the bone: they are also slow feeders; but for the reasons already assigned they, as well as the Northampton and Shropshire, are in esteem with the distillers.

The *Lincolnshire*, with well-formed heads and ears of a medium size pointing forwards, and curled at the tips; they are long and straight from the head to the tail, and of sufficient breadth; round in the carcass, and deep in the sides; the skin and hair thin. The true-bred pigs of this race are white, and rather tender; but they reach to thirty stone of fourteen pounds, and in point of profit may be ranked next to the Berkshire. This breed is also known (with some occasional variation) as the *Norfolk* and *Suffolk*.

The *Cheshire*, of various colours, but chiefly marked with broad patches of black, or blue, and white, have large heads, with long pendant ears; are of a great length, but proportionably narrow; curved in the back and flat-sided; large-boned, and long-legged, with much loose skin, and are altogether ill-formed; but they grow to an extraordinary weight, and are the largest kind of pigs in the kingdom, except

The *Rudgwick breed*, which take their name from a village on the borders of Surrey and Sussex, and are remarkable for the enormous size to which they reach.

Each of these breeds has its several advocates; but as their respective value does not, as in other species of stock, depend on soil and situation, these differences of opinion can only be ascribed to the want of sufficient comparative experiments, or to prejudice. A very competent, and apparently a very candid judge of the merits of the principal kinds, gives it as his decided opinion, that the Berkshire rough-haired, feather-eared, curled pigs, are superior in form and flesh to all others; even to the best Chinese *.

With regard to these two breeds that opinion must have been formed on fair experiments and due consideration of their respective value, for he mentions having fatted a Chinese sow to the weight of forty stone of fourteen pounds, at three and a half years old †; and the quality of the bacon, of both kinds,

* Mr. R. Parkinson, Treatise on Live Stock, Vol. II. p. 263.

† The height of this pig was 2 ft. 3 in.
Length ..... 4 11 Breadth

fatted and cured alike, was decided by a party of gentlemen at Lord Conyngham's table, in favour of the Berkshire. In this we, so far, unhesitatingly coincide; but, from all the other information we have collected on the subject, we are inclined to think that Mr. Western's Essex breed may fairly compete with either; and the Woburn breed has not yet been sufficiently tried to admit of a decisive comparison.

To these, also, there must, in justice, be added a breed partaking of the Essex blood, and generally known as the *Essex* and *Hertford breed.* It was introduced by Mr. Dods, of Chenies, in Buckinghamshire, (a most successful breeder,) and it will be seen, by a reference to the premiums given by the Smithfield cattle club, that it is held in high estimation *.

CHAPTER II.

ON THE BREEDING AND REARING OF PIGS.

SWINE are capable of propagation at eight or nine months; but the boar should be at least twelve months old before he is admitted to the sow, which will farrow a stronger and better litter, if she be kept to the same age. The period of gestation is from seventeen to twenty weeks †; when from five to ten, or more pigs, are produced: one boar should not be allowed to serve more than ten sows; and those sows are reckoned the best for breeding strong pigs which have about ten or twelve paps.

Where swine are kept solely for the purpose of *breeding*, it is necessary to pay the same attention to the principle of selection as in other articles of live stock. Hence, whatever sort may be

Breadth across the loins..	2 ft. 0 in.
Girth	9 10

* See Appendix, No. I.

† According to M. Teissier's observations on the gestation of animals, already alluded to in our preceding remarks on the other kinds, the extreme gestations of 25 sows were 109 and 143 days.

From the whole of his observations, M. T. infers, that the period of gestation is extremely variable in every species; and that its prolongation does not seem to depend either upon the age or constitution of the female, or upon the diet, breed, or season; or, in short, upon any known cause.

required, the boar and sow should respectively be chosen as perfect in symmetry and all other requisites as may be practicable; for the value of the progeny will mainly depend on the qualities of the sire and dam, and stock can never be raised with so much profit from inferior as from superior animals. They should also be well kept, in order to produce the necessary stimulus to coition: but, as with other cattle, care must be taken that sows, when expected to take the boar, be not too fat; experience having shown that, if they be in very high order, they will not produce an abundant litter of pigs.

As some will produce two litters in the year, the breeder will find it beneficial so to arrange each time of farrowing, that it may take place about the latter end of March or early in April, and towards the beginning or end of August: thus he will be enabled to rear them with less cost, and certainly with less probability of losing the pigs from cold weather, than if they were produced late in autumn. While the sows are in pig, they will require to be kept on nutritious food, in order that they may be in good heart at the time of farrowing, and after they have littered, it is absolutely necessary that they be regularly fed; for if the young pigs are deprived of their proper nourishment while sucking, they will never arrive at the weight they would otherwise attain. They should also be kept well littered and clean; but at pigging should not be allowed too much, as they are apt to overlay their pigs in it, for the first week *. At the end of a week or ten days after pigging, they may be let out of their styes into their yard, for three or four hours during the middle of the day, in order to stretch their legs, which is far preferable to total confinement.

It sometimes happens, at the first farrowing, that young sows will eat their progeny; to prevent which, they should not only be narrowly watched, as the period of gestation is expiring, but also be moderately fed, two or three days before the expected time of farrowing. Where, however, this precaution has been omitted, it has been recommended to wash the backs of newly-farrowed pigs with a sponge, dipped in a lukewarm infusion of aloes and water, which will prevent her from destroying them.

* In order to prevent such accidents, an open frame is sometimes placed on each side of the sow under which the young pigs can run, and thus escape the danger. A strong rail, elevated a few inches from the ground, will answer the same purpose.

Another circumstance worthy of notice, where there are several sows farrowing at the same time, is to confine them in separate pens or styes, otherwise they will mutually destroy their offspring; and, as these animals are, at such time, extremely mischievous, let them be supplied with plenty of water, which expedient is said to prevent them from committing any injury.

The best time for killing *sucking pigs*, for the market, is at the end of three weeks; by which time the others intended to be raised, will be able to follow the sow, and then the males may be castrated; the spaying of females may be deferred for another week.

When it is proposed to wean pigs, (the proper age for which purpose is two months, having castrated such as are not reserved for breeding at six weeks,) they should be kept in styes, having a small yard wherein they may run; both being kept perfectly clean and well littered. Their food must be good, and given as plentifully as they will eat. Boiled potatoes or carrots for a fortnight, and then raw ones, will prove good food; with a bait every day, for a month, of oats, and afterwards pea, or bean, barley, or buck-wheat meal, unless there is a dairy; in which case, a mess of milk or whey may be substituted till the clover-field is ready for them, which may be in the beginning of May; and, if the pigs are three months old, they will thrive well on that food. Lettuce has also been found very serviceable, not only on account of the succulence of the plant, but from its promoting an inclination to sleep, which is of the utmost importance to the growth of young animals; but in the rearing of pigs no kind of food can bear a comparison with milk. During the weaning, especial care ought to be taken in supplying them with abundance of sweet straw, and to keep the pigs in as clean a state as possible, so that they may always have fine sleek coats; a circumstance this of such consequence, that the want of it can never be compensated by the most plentiful supply of food.

In the management of swine, of whatever breed or variety they may be, it will be proper to have them *well ringed*, to prevent them from breaking into corn-fields during harvest; and that operation ought to be performed as early as possible, or the practice recommended by Mr. Tubb, a spirited breeder, at Lord Somerville's cattle-show, in 1805, may be substituted in lieu of ringing. It consists simply in shaving, or paring off, with a razor or sharp knife, the gristles on the top of the noses

of young pigs; the place soon heals over, and they are thus rendered incapable of that destructive rooting, or turning up of the ground, which farmers find so detrimental to sward land.

Lastly, sows may be allowed to breed till they are six years old; and a boar to serve them till he has passed his fifth year; after that time, the former may be spayed, and put up to fatten, and the latter may be castrated, as he is then no longer fit for generation, though his flesh will make excellent bacon. Throughout the management of these animals, the strictest regard to *cleanliness*, as already intimated, should be observed; for, notwithstanding they are, when left to themselves, proverbially filthy, it is certain that they will uniformly thrive better, and more speedily, if the styes are kept clean and well littered with straw; the expense of which will be more than compensated by the value of their *dung*; which, as well as every other species of filth, ought carefully to be removed.

Having thus specified the chief articles connected with the breeding of these animals, we shall mention a few hints, which may contribute to guard the unsuspecting purchaser against imposition, in *buying and selling swine* at markets, both in a *fat* and *lean* state. In the former case, it appears, from actual and repeated experiments, that every twenty pounds of live weight will, when killed, produce from twelve to fourteen clear weight: the advantage being in favour of large hogs: so that, if a farmer or breeder weigh the animals while alive, he will be enabled to ascertain the net profitable weight when dead. By weighing the hogs every week, he may also judge the best time for disposing of them to advantage; because, as soon as an animal ceases to acquire that daily increase which makes it beneficial to feed him, the best step that can be followed is to sell, or slaughter him without further delay.

With regard to the buying of hogs in a *lean* state, the most certain criterion, by which any judgment can be formed, is by weight; but as open markets seldom afford the means of weighing, a purchaser is generally compelled to rely on the accuracy of his eye; and therefore, if he has not already acquired sufficient experience, if a few lean pigs, of the same size as those intended to be purchased, be previously weighed, a standard will be obtained, which will enable him to decide with some precision, and, consequently, to offer a proper price.

CHAPTER III.

ON THE FEEDING AND FATTENING OF SWINE.

WHEN permitted to wander abroad, at pleasure, swine devour in marshy and miry grounds (in which situations they delight to wallow) fern, frogs, sedge, &c.; but, in drier spots, they feed on sloes, crabs, hips, haws, chestnuts, acorns, beech-mast, and similar wild fruit. In the domestic management of these animals, however, the quality and supply of their food is regulated by the divisions into which they are classed, according to their age and other circumstances. In order, therefore, that the food may be expended to the most advantage, it will be advisable to distinguish these animals in the following manner: 1. Sows with Pig; 2. Pigs; 3. Store Pigs; and, 4. Fatting Hogs.

1. With regard to *sows in pig*, it is obvious that they should be better fed than either of the two following classes, in order that they may be enabled to supply their young litter with the necessary supply of milk; but, while care is thus taken to keep them in good condition, equal caution is necessary that they be not too fat. Thus, for such as litter in the spring, tares and cabbages, combined with the waste milk and wash of the house and dairy, may be employed with advantage; or, if the supply from the dairy be not adequate to the demand, a wash may be prepared with oat, barley, or other meal. For those which litter in autumn, lettuces have been found very wholesome and nutritive, in addition to the wash; and in the winter season, potatoes, Swedish turnips, and other roots, previously prepared by boiling, should be added.

2. With regard to *young pigs*, they may be fed, after being weaned, in the same manner as sows; but the addition of pea-soup, made by boiling a bushel and a half of peas in about sixty gallons of water till they are thoroughly broken and dissolved, and either given alone or mixed with the dairy wash, will very materially improve their condition. If any dry meat be given, Mr. Young is of opinion that oats are preferable to any other

sort of corn, as barley is apt to disagree with them*. It certainly has frequently had that effect when the grain has been given whole, but no species of food has been found more fattening than barley-meal, especially when combined with milk: it is also an excellent addition to steamed potatoes. Whatever may be the food, it is commonly thought that it better promotes the growth of young pigs if given warm, than cold.

An intelligent farmer in North Britain, who keeps from five to seven breeding swine, disposes of most of their produce, when from six weeks to three months old: considering this system fully as profitable as fattening them for sale. At these ages he generally has a good demand for them, as many people, such as tradesmen, villagers, &c. wish to fatten a pig or pigs, who could not conveniently keep a breeding sow. Having this advantage, there is scarcely a cottager, or weaver's family in the neighbourhood, who have not their fat pig killed, after being fed on the refuse of their potatoes and the offals of their kitchen, to the weight of from eight to twelve stone†. In the vicinity of large towns, and particularly where there is the advantage of a dairy, it will be found more profitable to keep them until about four months old, and sell them fat as porkers, unless when they are farrowed so early in the spring as that they would become fit for the butcher in the heat of summer, at which time pork is not usually saleable.

3. *Store pigs* are those which have attained nearly half their growth, and should be separated from others in the course of May, when they may be turned into the clover and cichory fields, the gates of which should be locked on them. Here they are to continue till Michaelmas; but in order that this system of management may be attended with due effect, it is necessary that all the fences be in excellent repair, and that there be a pond in the field to supply the animals with water. A larger number of swine may be thus kept, and they generally pay a fair price for their feed; but with all the advantages of the system, that of soiling swine in the yards, will usually be found more profitable, notwithstanding the expense is greatly increased, and some portion of food will be necessarily

* Farmer's Calendar, p. 22. Mr. Marshall also mentions that opinion as being prevalent in Leicestershire. Midland Counties, 2d Edit. Vol. I. p. 329.

† Sir J. Sinclair's System of Husbandry pursued in Scotland, Vol. I. p. 149.

wasted; for, by being kept quiet and prevented from rambling, they thrive faster than in the field, and the manure is more valuable when thus collected, than if dropped abroad. The proper vegetable crops for this purpose are lucern, cichory, clover *, tares, and other green meat. But, in order to carry on this system with effect, there should be an ample supply of litter, together with sand, peat, or earth, to be laid on the ground for the purpose of absorbing the urine. In addition to the articles above specified, we state on the authority of Dr. Pulteney †, that the water-crowfoot, (*Ranunculus aquatilis*, L.) is not only relished by swine, but these animals likewise thrive so well on that vegetable, as to require no other food till they are put up to fatten. For the winter-keep of store swine the various roots are admirably calculated, such as turnips and potatoes, which require to be boiled; and Swedish turnips, cabbages, carrots, mangel-wurzel, and parsnips, which may be given in a raw state. Potatoes, when given alone, should be *steamed*; but it has been found more advantageous to give them in conjunction with turnips; in which case the latter are *boiled*, and the liquor is given with the roots, which are then made into a mash: the liquor from potatoes should never be given. It may be almost unnecessary to add, that the Swedish turnip is preferable to the white, whether boiled, or raw. With regard to the soiling of pigs, Sir John Sinclair has noticed a discovery of considerable moment: it is, that they may be soiled on cut green beans with great profit, and that they are ravenously fond of these. The Windsor sort is preferred, and the beans should be planted at three different times for the sake of regular succession. The feeding may commence in the beginning of July, and terminate about the end of September. When pork is worth 7½*d.* per lb., the profit, besides a quantity of most valuable manure, is calculated to be about 10*l.* per acre ‡.

4. The business of *fattening hogs* is generally performed in February or March, and in the month of October; for *pork*, they are usually fattened from six to nine months old; for *bacon*, from nine months to a year and a half; and store swine to

* Where *cottagers* have gardens and keep pigs, it would be profitable if they had a small spot of clover in their gardens to cut for them.

† Transactions of the Linnæan Society, Vol. V.

‡ Sir J. Sinclair on Scottish Husbandry, Vol. II. p. 18.

the same period, or very rarely, beyond two years: the latter, however, is the preferable age, for substantial bacon for farmers' use, for which purpose the hog should also be made quite fat. For porkers, butter-milk, whey, and barley-meal are preferable; for bacon hogs, equal parts of fresh pollard and pea-meal have been recommended; and it is a fact, that white peas are much better calculated than beans either for feeding or fattening swine, as these animals not only fatten more kindly when fed with the first-mentioned pulse, but their flesh is also said to swell in boiling, and have a good flavour; while that of swine fattened on beans will shrink in the pot, the fat will boil out, and be less delicate in point of taste. Hence many farmers feed their hogs with pea and barley meal, and will frequently purchase peas when their own store is exhausted, rather than suffer the beasts to feed on beans; and some will even reject grey peas, as approaching too near to the nature of the bean, and making the meat tough and dry. The proportion of peas requisite to fatten a hog necessarily varies according to the size, breed, and kindliness of disposition to fatten; but forming an average judgment from the weight of the animal both before and after he is put up, a hog in good condition when put up, and intended to be fatted to twenty score, will consume about six or seven Winchester bushels of peas; and it has been found that each bushel will increase his weight after the rate of nine or ten pounds.

The most profitable mode, in the estimation of Mr. Young, of converting any kind of corn into food for swine, consists in grinding it into meal, and mixing the latter with water, in cisterns, in the proportion of five bushels of meal to one hundred gallons of water; this must be well stirred several times in the day, for a fortnight, during warm weather, or for three weeks in a colder season; at the expiration of which time it will have fermented and become acid. In this state, and not before, the wash is ready for use: it ought to be stirred every time before feeding, and it will be necessary to keep two or three cisterns fermenting in succession, in order to prevent it being used before it is duly prepared. The difference of profit between feeding in this manner, and giving the grain whole, or only ground, Mr. Y. adds, is so great, that whoever tries it once, will not be induced to change it for the common methods. He further states, that pea soup is an excellent food for hogs; and, as

far as he is capable of knowing, (for he admits that he has not sufficiently compared them,) may be equal to the acid mixture above mentioned, especially if it be given during winter in a tepid or lukewarm state; but, in adopting this method, the additional expense of fuel and labour must be taken into consideration. The refuse wash, or grains of distilleries, likewise furnish a wholesome and useful article in the feeding and fattening of swine. The refuse of starch manufactories is likewise employed with great advantage for the same purpose.

For the general stock of hogs, during the month of October, and part of November, cabbages are of incomparable use. Swine are at that period often very cheap: and in such case it is of material consequence, that the farmer be amply supplied with an article of food, by which means he can keep this stock for a better market; in fact, without a provision of cabbages, or other roots, it will be impossible to keep large stocks of swine to the best advantage.

The duration of time which is requisite for fattening these animals may, upon an average, be computed at five or six weeks, or thence to two or three months; and this period will, in most cases, be found fully adequate for the purpose, though the length of time is necessarily regulated by their kindliness of disposition to take on fat, the relative goodness of their condition, when first put up to fatten, and the quality of the food. On the latter subject more experiments have been tried on pigs, than upon any other animal; from an idea that in consequence of their extraordinary voracity, they will fatten on any thing. It is true that they will grow with any kind of garbage that fills their stomachs, and that they will even put on a certain quantity of flesh when fed only on potatoes: but good, firm bacon is only to be made by means of sound corn and pulse, and in exact proportion to the nutritive quality of the food will ever be the weight and value of the meat.

Whatever system of fattening swine may be adopted, it is of essential consequence that they be kept warm and clean, especially in cold and damp weather, during the period of fattening; and that they also be supplied with abundance of litter, the cost of which will be amply repaid by the increased proportion of excellent dung thereby obtained. It has, indeed, been frequently asserted, that swine thrive better while fattening, if they be allowed to wallow, at home, in their own filth, and abroad in

'et, because they delight in this habit; and thence
as certain, that it tends to their advantage. Such
wever, is rather the offspring of prejudice than
experience: we know that animals, when op-
vill plunge into water in order to cool them-
be inferred from this circumstance, that it
cial to them. Besides, as there is an
lers of this part of the brute creation
race, as well as in the causes whence
nall here only remark, that swine are liable
by drinking too much cold water, or wallowing in
numid places when overheated, and refer the reader
another Book *, where the maladies incidental to these animals are discussed. In addition, therefore, to some remarks which will be subsequently offered on the structure and situation of the piggery †, we shall here state, particularly with reference to its connexion with their fattening, that a hog-stye should be built with the advantage of running water, so as to admit sufficient for the swine to drink, if such a situation can be commanded; the floor, or ground, being laid upon a gentle declivity to carry off their urine.

Not only, however, should these animals be kept warm and dry while fattening, but they should also be confined, if possible, by themselves; or, at all events, there should be as small a number in the same stye, and as much out of the hearing of the cry or grunt of other hogs as possible; otherwise, upon their first confinement, they will pine and decrease in flesh, notwithstanding they have abundance of food given them. By this means they will be enabled to take more frequent and uninterrupted repose, which greatly contributes to promote their fattening; beside which, all those inconveniences will be effectually obviated, which often occur from hogs worrying each other, and from the weaker being deprived by the stronger of their fair proportion of food.

Regularity of feeding should likewise be especially regarded, as it has great influence in facilitating or retarding the fattening of swine; hence it will be proper to give them a full allowance of food three or four times, or at certain other stated intervals,

* Book VI. Chap. IX.
† Book VII. Chap. II. Sect. 6.

in the day, as convenience or other circumstances will allow. And, if any animal should have surfeited itself, (which is no unusual occurrence, where due regard is not bestowed on the point last stated,) by eating too large a proportion of food, it will be advisable to give about half an ounce of flour of sulphur in some wash, once or twice in the course of the day, for two or three successive days. By this simple remedy their palled appetite will be restored more effectually than by administering antimony, or any other drug that has been recommended to use in fattening swine; for, however such articles may *possibly* have succeeded in a *few* instances, it is obvious that they cannot be generally employed with advantage, and may not unfrequently be productive of hurtful effects.

A practice has been for a long time introduced in the county of Essex, though not yet generally followed, of fattening pigs in separate stalls. These are so constructed, as to admit only one pig each, only allowing room for him to lie down, but not to turn; they are built with the bottoms on a sloping direction to carry off the filth, and some persons do not give any litter, from an idea that their chewing it might be prejudicial to their thriving.

The food given is usually barley-meal and water; and they are found to fatten far better in these styes, than in the common ones; which is attributed to their being more quiet, having only to eat and sleep: it has, indeed, been found, that a hog half fat, when put into one of these cases, has gained fifteen pounds a week in flesh *.

This experiment has also been tried with success, by Lord Egremont, in Sussex. A hog was confined, on the 4th of March, in a cage made of planks, of which one side was made to move with pegs, so as exactly to fit him, with small holes at the bottom for the water to drain, and a door behind to remove the soil. The cage stood upon four feet, about one foot from the ground, and was made to confine the animal so closely, that he could only stand up to feed, and lie down upon his belly; the sliding partition was extended according as he increased in size.

This hog when put up weighed eleven stone two pounds (eight pounds to the stone,) and was killed on the 13th of April following, when he weighed eighteen stone three pounds, having

* Young's Agricultural Survey of Essex, Vol. II. p. 343.

thus gained seven stone two pounds, live weight, in five weeks and five days. His food consisted of two bushels of barley-meal, and about eight bushels of potatoes: he was sulky during the first two days, and would not eat. The most remarkable part of this experiment, however, is, that seven other hogs of the same breed were put up in the common mode, and killed at the same time; and though better fed, were not in equal condition *.

Lord Egremont has also tried a comparative experiment on the value of barley and rice as food for pigs. It is not stated with sufficient accuracy in the county report in which it is mentioned †, as the respective gross cost is alone stated, without the weights; but the pecuniary result was in favour of the barley.

In that experiment the rice was given dry; but in another it was boiled, and the result was as follows:—

The total weight of ten hogs, put up on the 3d of November, was	1045 lbs.
Ditto on the 30th of December . . .	1668
Gain in live weight . . .	623 lbs.
The quantity of rice consumed, was . .	3033 lbs.

Which, being at the rate of five pounds of rice to one pound, live weight, of flesh, clearly shews that rice cannot be used for this purpose with advantage, unless it can be obtained for a far less price than that at which it is usually sold.

CHAPTER IV.

ON CURING BACON.

HAVING already stated a few data that will assist the breeder to form an estimate of the progress made by hogs in fattening, and

* Agricultural Survey of Sussex, p. 386.
† Ibid. p. 389.

of course the most proper time to dispose of them with benefit, we shall conclude this Book with a few remarks on the best modes of converting their flesh into *bacon* and *pork*.

In Hampshire, Berkshire, and some of the adjoining counties, after a hog is killed, the first process is to *swale* him, or singe off the hairs, by kindling a straw fire round the dead animal, which is far preferable to the practice of scraping off the bristles with the assistance of warm water; the latter mode having the effect of softening the rind, and injuring the firmness of the flesh. Next, he is cut into flitches, which are effectually rubbed with a mixture of saltpetre and common salt, and are laid in a trough; here they continue from three weeks to a month, in proportion to their size, and are frequently turned during that time. Thence they are taken out and suspended in the chimney, over a wood or turf fire till they are perfectly dried. In the county of Kent they are dried before a slack fire, which operation requires a similar period of time with that required for salting; and, in each of the respective counties above mentioned, they are hung up, or deposited on racks, till they are wanted for domestic consumption.

Somersetshire or *Wiltshire bacon*, which is the most esteemed in England, is prepared and cured in the following manner:— When a hog is killed, the sides are laid in large wooden troughs, and sprinkled over with bay salt, after which they are left for twenty-four hours, in order to drain off the blood and superfluous juices. Next they are taken out and wiped thoroughly dry, and some fresh bay salt, previously heated in an iron frying-pan, is rubbed into the flesh till it has absorbed a sufficient quantity; this rubbing is continued for four successive days, during which the sides, or *flitches*, as they are usually called, are turned every other day. Where large hogs are killed, it becomes necessary to keep the flitches in brine for three weeks, and in the interval to turn them ten times, after which period they are taken out and dried in the common manner; in fact, unless they are thus treated, they cannot be preserved in a sweet state, nor will they be equal, in point of flavour, to bacon that is properly cured.

According to the two methods above detailed, the bacon is made without stripping off the hide or skin; in some counties there prevails a contrary practice, which has lately been recom-

mended on the continent, as being preferable of the two, because it affords an opportunity of advantageously converting the skin into leather, while the meat is said to take salt and be cured equally well as in the former mode. This method, however, is not a very novel one; the hides of swine have long since been made into shoes in China, where all the shoes sold to Europeans are manufactured from hog leather, the hair being previously burnt off by means of a red hot iron. Where the *consumption* of bacon is very *rapid*, the practice last mentioned may be adopted; but we know from experience, that bacon will, in a short time, become rusty, and consequently waste will more or less be incurred, unless it be cured with the rind or skin, and be preserved in a dry room.

The *hams* of hogs are likewise converted into a favourite, though not a very digestible, article of food. In the county of Westmoreland, which is celebrated for the flavour of its hams, the following method prevails:—First, they are rubbed very hard, usually with bay salt, after which they are by some curers covered closely up, while others leave them on a stone bench for the purpose of draining off the brine. At the expiration of five days, this friction is repeated with equal vigour with bay salt, combined with somewhat more than one ounce of saltpetre to each ham. Next they are suffered to lie for about a week, either in hogsheads among the brine, or on stone benches, when they are hung up in the chimney to dry. In this last part of the process there is a difference of practice: by some they are suspended so that they shall be dried solely by the heat arising from the fire below, without being exposed at all to the smoke; by others they are hung up in the midst of the smoke, whether this arises from coals or peat. If not previously sold, they are suffered to continue there till the weather becomes warm, when they are packed up with straw or oatmeal seeds, and sent to the respective places of sale.*

* Report of the Agriculture of Westmoreland, 8vo. edit. In Spain and Portugal, where the hams are remarkably fine flavoured, a large quantity of sugar is used along with the saltpetre in curing them. It assists materially in the conservation of the flesh, and renders it peculiarly mellow. Sugar is there, also, very generally put into the water in which they are boiled; and is found to render them tender. Though not quite relevant to the subject of *curing*, it may also be remarked, that hams are much improved in the *dressing*, by being only first *half-boiled*, and then *baked*.

Another mode of curing or preserving the flesh of swine is, by salting it down for *pork:* the tedious and common process by which such pork is cured being sufficiently known, we shall state the following simple method, which has been employed on the continent with great success, and which is the more valuable as it may be advantageously applied to *mutton* and *beef.* First, let two ounces of saltpetre, one pound and a half of refined sugar, and four pounds of common salt be boiled in two gallons of pure spring water, over a gentle fire, and the impurities, that may rise to the surface, be carefully skimmed off. When this brine is cold, it should be poured over the meat, so as to cover every part: for *young pork* this immersion should continue three or four days; older pork will require one, two or three days more, according to its age; and such as is intended to be dried for hams, ought to remain in it a fortnight before it be suspended in the chimney. At the expiration of that time, the latter must be rubbed with pollard, and covered with paper bags, to prevent them from being *fly-blown.* It ought to be observed, that in warm weather the blood must be expressed from the meat, and this should be well rubbed with fine salt previously to pouring the liquor over it; and though the preparation of such brine may, at first sight, appear more expensive than that prepared in the common way, yet we think it deserves a preference, as it may be used a *second time* with advantage, if it be boiled, and a proportionate addition be made of water, and the other ingredients above mentioned.

BOOK THE SIXTH.

ON THE DISEASES OF CATTLE.

CHAPTER I.

DISEASES INCIDENT TO CATTLE IN GENERAL.

The brute creation are, in general, liable to fewer maladies or complaints than mankind; and, as their diseases are less complicated, they are of course more easily to be relieved: yet, among the various phenomena in the history of man, it is not the least singular, that the treatment of sick cattle has hitherto been confined chiefly to the most illiterate and ignorant peasants—men equally unacquainted with comparative anatomy and with the relative powers of medicine. Hence many thousands of valuable beasts have necessarily perished for want of that assistance which attentive observation, aidéd by sedulous inquiries, might have remedied, if not altogether prevented.

Various, indeed, are the maladies, to which cattle are liable: and, though constant and careful examination of their health will greatly contribute to the prevention of diseases, yet it will frequently happen that they become sick, either from the effects of our variable climate, or from causes which all the vigilance of the farmer cannot possibly control. It would greatly swell the limits of the present work, were we to enumerate every malady incident to cattle: we shall therefore confine our attention to a few of those which are of most common occurrence, and

for the rest can with confidence refer the farmer to Mr. Clater's useful work on the Diseases of Cattle—the result of forty years' practice and experience. But it cannot be sufficiently impressed upon the owner of cattle, that in all sudden cases, it will be his real interest promptly to call in the aid of some expert cattle-doctor.

Colds are frequent attendants in the rearing of numerous animals, and are too well known to require any minute description. In these affections, as in every other malady, prevention is preferable to cure; it will, therefore, be necessary to preserve cattle from undue exposure to sudden blasts of wind, particularly from the north-east. When they become confirmed, or settle on some internal part of the body, the affected cattle may be easily discovered by the hollowness of their flanks, the roughness of their coats, the running or weeping of their eyes, and the heat of their breath. Colds prevail chiefly in the brute creation, as among mankind, in those springs which follow mild winters; and as they become contagious if long neglected, the diseased beasts should be selected as early as possible, and conveyed to a warm shelter or stable. Here they must be supplied with wholesome food; and, if the feverish symptoms increase rapidly, it will be necessary to take about two quarts of blood from the animal, except in the case of milch-kine. A warm drink, consisting of one quart of ale, with ginger, and a small portion of laudanum infused in it, should be given the beast, and the dose be repeated at the expiration of six hours. The drink ought to consist of warm water, in which nitre is dissolved; and abundance of litter should be allowed. As the animal recovers, it must be gradually exposed to the air, till it becomes sufficiently hardy to be turned out among the herd.

The *Colic*, or *Gripes*, may be ascertained by the restlessness of the diseased animal, which rises up and lies down almost incessantly, continually striking its head and horns against any object that occurs. Young cattle are chiefly affected by the colic; which is attended either with a *scouring* or with *costiveness*, and which of course must be treated according to those two circumstances. In the former case, a warm draught should be given, consisting of one quart of ale mixed with a few drops of laudanum, and two or three ounces of oil of sweet almonds; or, which perhaps is preferable, with half a pint of olive oil,

and sweetened with sugar. This draught is to be repeated at the end of twelve hours, or oftener, as the nature of the case may require. When the colic is accompanied with costiveness, the following purge should be given as early as possible:—

> Dissolve from *four* to *six* drachms of fine Barbadoes aloes (according to the size of the beast, and the urgency of the case) in half a pint of brandy, or other ardent spirit; mix the infusion with two quarts of water-gruel, and administer the draught in a lukewarm state.

In both cases, great and speedy attention is necessary, to prevent inflammation of the intestines, which must otherwise prove fatal; the beasts should also be kept warm and dry, in order to promote perspiration.

Foul.—This disease affects the feet of cattle, chiefly in consequence of hard driving, where they travel through much dirt. The part affected must be cleansed by washing, in order to discharge the offensive matter contained in the clees, or claws; after which they should be dressed with a mild digestive ointment, and kept perfectly clean from all filth, or other extraneous articles. Sometimes, however, the foul becomes *horny*, in consequence of neglect, and though no material discharge takes place, is yet very painful; such indurations may be discovered by pressure with the hand, and must be removed with the knife, attention being paid to the directions above stated.

Hoven.—No distemper is of more frequent occurrence among cattle than that of being swollen, that is *blown*, or hoven, as it is usually denominated by farmers. It is induced either by exposure to damp situations, by too sudden removal from an inferior to a rich pasture, or by their eating too eagerly of turnips, clover, or any other succulent food, especially before the dew is off in the morning; thus the stomach is loaded with food, and the process of rumination, or chewing the cud, being prevented, the animal becomes swollen with confined air, which penetrates into the stomach and intestines. Its preventive is obvious, and consists simply in turning cattle into such rich pastures only when they are not pressed by hunger, so that their appetite may be soon gratified; or they should be gently driven about for a few hours, that the dew may not only have time to evaporate, but also the animals being thus suffered to graze

for the rest can with confidence refer the farmer to any useful work on the Diseases of Cattle—the result of practice and experience. But it cannot be too strongly urged upon the owner of cattle, that in all sudden attacks his real interest promptly to call in the aid of a skilful doctor.

Colds are frequent attendants upon the winter animals, and are too well known to require description. In these affections, as in all others, prevention is preferable to cure; it will, therefore, be proper to protect cattle from undue exposure to cold winds, particularly from the north-east. When a cold has begun to settle on some internal part, the symptoms will soon be easily discovered by the dryness and unusual roughness of their coats, the heat of their noses, and the heat of their mouths. [illegible] account creation, as among [illegible] often obliged to go winters; and as [illegible] following recipe, (which we diseased beasts [illegible] s "Annals of Agriculture," Vol. veyed to a wr[illegible] of simple, cheap, and common ingre- with wholes[illegible]ne useful. Let three quarters of a pint of rapidly, it [illegible]ne pint of melted butter, or hog's lard, be mixed from the [illegible] and given to the animal by means of a horn or bottle; drink, [illegible]ourable change be produced in a quarter of an hour, porti[illegible]ame quantity may be repeated. This dose is calculated and [illegible] cattle: for sheep, when hoven or blown, a wine-glass d[illegible] and a half, or two glasses, will be sufficient to be given in [illegible] manner. And it is asserted in the communication above cited, that this remedy is a specific for the malady in question, effecting a cure within the short period of half an hour. Where, however, the pen-knife is resorted to—and necessity alone can justify it—*the incision ought to be made with a small pen-knife, very sharp at the point, with a sudden push*, four inches from the hip-bone, and four inches *from the edge of the loin*.

Various instruments have likewise been contrived, with the view of relieving hoven cattle, two of which merit to be particularly noticed. The first of these is a flexible, metallic tube, invented by the celebrated professor of anatomy at Edinburgh, Dr. Monro; by whom it was announced to the public in 1793.

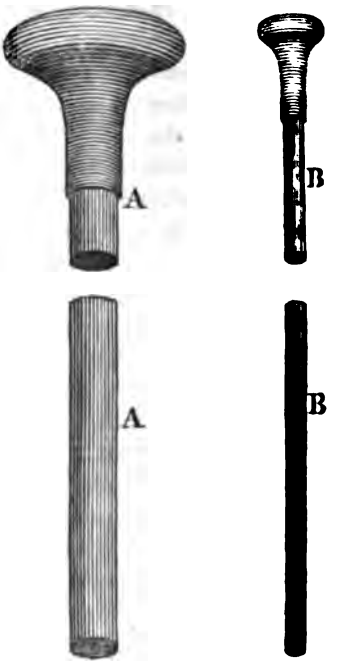
f iron wire, about one-sixteenth of an inch in dia-
round a polished iron rod three-eighths of an
. in order to give it a cylindrical form; the
ken off, should be covered with soft, smooth
of the tube, which is intended to be passed
ss pipe, two inches long, of the same
than, the tube, is to be firmly con-
tube from bending too much within
vire, one-eighth of an inch in dia-
the tube, is placed within it,
s entered the stomach.
distance from the fore teeth
a large ox is about six
ix feet, or two yards in
e effectually with the largest
entered the stomach, it may continue
of time, as it does not impede the respira-
nal. The greater part of the confined air will
arged through the instrument; and, in case it should
nought necessary, the remaining condensed air, or the superfluous moisture in the stomach, may be absorbed thence, by fixing a bellows to the upper end of the tube, with two valves, one at the muzzle, the other at the side of it, and so disposed as to allow the air to pass in the direction from the stomach upwards. At the same time, should it be deemed advisable to inject any ardent spirits, or other liquor calculated to check the fermentation, that operation may be performed with the utmost safety through this tube *.

Equally useful with the flexible instrument of Professor Monro, is the instrument invented by Mr. Eager, for relieving hoven cattle and sheep; for which the Society for the Encouragement of Arts, &c. in 1796, voted to him a premium of fifty guineas. It is as follows:—

* Much further information on this subject may be found in Marshall's Works, and the Transactions of the Society of Arts.

The letters A A represent the knob of wood, and part of the cane to which it is attached, of a proper size for oxen, or other large cattle; the length of such cane should be six feet.

B B is the knob of wood, and part of the cane, calculated for sheep; its length ought to be three feet.



When any beast is swollen, or hoven, Mr. E. directs a person to lay hold of it by the nostril and one horn, while an assistant steadily holds the tongue with one hand, and with the other pushes the cane down the animal's throat. Attention must, however, be paid, that the animal does not get the knob of the cane between his grinders, and that it be thrust to a sufficient depth, because its whole length will do no injury. As an obstacle will occur at the entrance of the paunch, the cane should be pushed with additional force; and, as soon as a fetid smell is observed to issue from that place, and the body of the beast sinks, the cure is performed, and nature will complete the rest.

Mr. Eager, in his communication to the respectable Society above mentioned, adverting to the cause of this disorder, attributes it to the superabundance of air introduced into the stomach by eating too large quantities of succulent food at one time, which occasions a more than usual portion of air to ascend from the paunch of the beast. This forces the broad leaves before the passage at the end of the stomach, as these leaves prevent the wind from passing upwards in its regular course. Consequently the paunch begins immediately to swell; the air becomes rarefied by the heat of the body, so rapidly as to impede the circulation of the blood; and the beast, whether ox, cow, bullock, or sheep, inevitably expires, unless speedy relief be procured. It only remains to add, that Mr. Eager's plan and instruments have been sanctioned by the Earl of Egre-

mont, as well as by several eminent farmers, who have attested their efficacy in relieving blown or hoven cattle.

Cheap and economical, however, as both these useful contrivances confessedly are, yet as *two* persons may not always be on the spot, to give relief to the animal, it becomes important to have recourse to other more portable and prompt mechanical assistance that may be given by one individual. For this purpose, Mr. Mason (of Goodrest Lodge, near Warwick) in a communication to the Society for the Encouragement of Arts*, advises the use of the trocar and canula commonly employed by surgeons, for the relief of hoven cattle; and to penetrate with the trocar and canula through the beast's hide, to the paunch, on the near side, about six inches from the back-bone, at an equal distance from the last rib, and from the hip-bone. The trocar is then to be withdrawn, and the canula left in the wound, until the air has escaped from the paunch, when the canula may be taken out, and the wound covered with a plaster of common pitch, spread on brown paper, about the size of a crown piece. Mr. Mason states, that this operation is neither injurious to feeding oxen, nor even dangerous to cows in calf; and that it has been found particularly efficacious in preserving young calves when afflicted with this disorder, which proves fatal to numbers of them.

The very frequent occurrence of the disease now under notice, will justify the length at which we have treated its proposed remedies: on the efficacy of that suggested by Mr. Mason, no doubt, we think, can be entertained. Its superiority over other modes of treatment is very great, as it may be at all times applied with less risk than stabbing with a pen-knife, and certainly with less delay than waiting for assistance to apply the flexible tube. The size of the trocar also renders it a convenient instrument, to carry in the pocket at all times, when cattle are feeding upon clover; and the operation can scarcely be performed in such a manner even by the most ignorant servant, as to be attended with danger to the life of the animal.

Looseness, or *Scouring*, equally affects oxen and cows, though its causes in both are different. In general, it arises either from want of sufficient food, both in quality and pro-

* Transactions of the Society of Arts, &c. Vol. XXVI., pp. 128—131. For this communication, the Society presented Mr. Mason with their silver medal.

portion; from being over-heated or over-worked; by feeding on wet, unwholesome fog, or after-grass; or on bad hay and straw; and by not being lodged in dry situations; though it is sometimes an hereditary taint, and in cows is caused by their taking cold while calving. But whatever be the cause, as soon as the scour or lax begins to appear, (and it may be easily known by their general debility and loss of flesh, the increasing paleness of their eyes, and irregular beating of the pulse, weakness of appetite, and frequent discharge of slimy excrement,) it will be necessary to house the beast, and put it to dry food; which, in early stages of the disease, will mostly effect a cure. Should the looseness increase, a pound of mutton suet, boiled in three quarts of milk, till the former is completely dissolved, may be given in a lukewarm state, which will contribute to allay the soreness necessarily occasioned by the continual irritation of the abdominal vessels. Or, in cases of obstinate scouring, the following drink may be beneficially administered:—

> Let half a pound of grossly-pulverized tormentil root be boiled in two quarts of water, till this is reduced to one quart; strain it off, add a quart of red wine, a quarter of a pound of finely-powdered chalk or whiting, and two ounces of diascordium, without honey.

This mixture should be preserved in a bottle for common use, and well shaken together; it will be proper to make it lukewarm before it is given. The dose is half a pint, to be administered three times in the day, at nearly equidistant periods till the beast recovers. Or, in similar cases, the following preparation may be given with equal, if not superior advantage:—

> Boil half a pound of pulverized common chalk in two quarts of water, till the latter is diminished to three pints: then add four ounces of hartshorn shavings, and one ounce of cassia, stirring the whole carefully. When the decoction is cold, add two drachms of Thebaic tincture, or tincture of opium, and one pint of lime water.

The whole should be kept closely stopped in a bottle, being well shaken before it is used: the dose is one or two hornsful, to be administered two or three times in the course of the day, as the nature of the case may require. But where an hereditary *taint*, or *debility*, is the immediate cause of the scouring rot, as this malady is sometimes termed, it will baffle all the powers of medicine.

The *Pantas, Panting-evil,* or *Pantasie,* prevails chiefly during the intense heat of summer, though it is sometimes occasioned by sudden colds. It may be easily known by the panting, or heaving, of the animal's flanks, which is likewise accompanied by trembling and decay of flesh. In the treatment of this disease, it will be necessary to house the beast, and to give him every six hours (during the continuance of the chilly symptoms) one quart of warm strong beer, in which one table spoonful of laudanum, a similar quantity of ground or grated ginger, and two table-spoonsful of spirit of hartshorn have been previously infused. His food should consist chiefly of sweet, dry hay, with warm water, in which nitre may be dissolved, if a fever be approaching; and the animal should be well littered with abundance of straw. As he gains strength, he should be gradually accustomed to the air, and after a short time will be fully recovered.

Poisons. While grazing abroad, cattle are subject to a variety of casualties or accidents, by eating the leaves of yew, various species of crowsfoot, and other acid plants, as well as by bites from mad dogs, or venomous reptiles. In the former case, the most effectual practice consists in drenching the animal with a mixture of equal parts of lukewarm salad oil and vinegar, afterwards giving a gentle purgative of Glauber's salt, or Socotrine aloes; and, if the viscera appear preternaturally distended with air, by administering a tepid infusion of tobacco in the form of a clyster. With regard to bites of mad dogs, the only certain remedy is to eradicate the lacerated part, either by excision or by the actual cautery, the wound being kept open for a considerable time; but in cases of bites by serpents, or vipers, we know of no better remedy than the continued and copious use of spirits of hartshorn, both as an application to the part affected, and also internally as a medicine.

Red Water, or *Bloody Urine.*—The name of this malady sufficiently indicates its nature, so as to render a specific description of it unnecessary; it may be easily discovered, in recent cases, by the animal's making frequent but fruitless attempts to discharge urine; but when they make much and frequent, with a considerable effusion of blood, it is a dangerous symptom. Cattle thus affected, usually leave the herd; extending their tails, they apparently feel pain in the urinary canals, and not unfrequently set their backs up higher than common.

The red water chiefly attacks young beasts, and is caused either by sudden changes of weather: eating acrid or prickly vegetables that puncture the smaller blood-vessels, and consequently produce the bloody discharge; by bad or coarse food; and likewise by bad or stagnant water.

As soon as a beast is discovered to void blood, it should be conducted to a warm, dry shelter, and kept on good hay, or similar dry food; formerly, and in many places the custom still prevails, it was the practice to drench the animal with a pound of Glauber's salts, repeating the dose on the following day. But such violent remedies are by no means calculated, in our opinion, to operate as a styptic, to prevent the discharge of bloody urine; on the contrary, they rather tend to relax the animal, (already sufficiently weakened,) in a yet greater degree. We would therefore prefer a strong decoction of Peruvian bark, (for which oak bark may be substituted if necessary,) in which a small quantity of alum has previously been dissolved. The dose may be two or three hornsful, to be given twice or thrice in the day, at nearly equidistant periods, accordingly as the violence of the disease may require.

The *Staggers*.—This disorder is variously known by the names of the daisy, dizziness, epilepsy, lethargy, turning or vertigo, that sufficiently indicate its symptoms, the chief of which is a lethargic drowsiness, accompanied with a wavering, unsteady, and staggering gait. The seat of this malady is either in the *brain* or in the *stomach*; in the former case, it is usually produced by hydatids, or small transparent bladders filled with water, or by some other matters immediately acting upon the brain. Where this is the cause, medicine can afford no assistance whatever; but we remember an instance of epilepsy which occurred many years since, where this formidable disease was cured by the operation of *trepanning*, which was performed by Mr. Cheston, an expert surgeon, then residing at Gloucester, and has since been practised in many cases with success. But where the staggers is caused by plethora, or too much fulness of blood, bleeding, and cooling purgative medicines should be resorted to; and, as it is necessary to confine the beast in a warm stable or shelter, it will greatly contribute to promote the circulation, thus necessarily stagnated for want of exercise, by rubbing him every day with dry straw, and allowing him plenty of litter to promote perspiration.

Wounds.—Cattle, in general, are subject to a variety of accidents, which the limits of our work forbid us to specify, and which indeed are so numerous, that it is scarcely possible for human foresight to provide for every contingency. Hence our remarks will be confined to the most appropriate remedies for punctures, bruises, or common wounds.

In cases of common, fresh wounds, nothing is more necessary than to apply a salve, consisting of white lead, and oil of turpentine, incorporated together with a little brandy, to the lips of the cut, which should be drawn as closely together as possible; and carefully to exclude the air. But if the laceration be deep, it must be washed with warm milk and water, and the ragged flesh, if any, cut out with a sharp knife: after which, the wound may be filled with lint or tow, dipped in a digestive ointment, composed of Venice turpentine and balsam of copaiba, or capivi, of each one ounce, with two ounces of yellow basilicon. The wound must, as in the former case, be kept from air and dirt, or its healing will be materially retarded.

The following remedy has been recommended as a certain styptic for fresh wounds: Bruise equal parts of stinging-nettles and salt in a mortar, till a pulp or mash is formed, and apply it to the wound; the bleeding of which, it is asserted, will *immediately* cease, however deep or dangerous such wounds may be. Not having had experience of its efficacy, we cannot vouch for its utility; but as the articles are always at hand, this specific, if such it be, certainly deserves a fair trial. Where, however, an animal has received any blows or bruises, without breaking the skin, it will be sufficient to bathe the part affected with camphorated spirit of wine; but if the swelling become inflamed, it will be requisite to make a slight incision below the contused spot, in order to promote suppuration, after which the following salve, or plaster, may be applied.

> Let frankincense and Venice turpentine, of each one ounce, be gradually incorporated over a slow fire, with two ounces of Burgundy pitch; and, when of a proper consistence, let a sufficient quantity be spread upon a pledget of tow or strong linen rag, and well fastened on with a bandage.

As soon as the wound begins to discharge the matter freely, the digestive ointment and treatment just mentioned may be adopted. Lastly, should any swellings or local humours arise, without the beast receiving any external injury, or if the skin should be very

slightly bruised, they will be effectually removed by rubbing the part affected repeatedly with the hand copiously moistened with Goulard's mixture, which is prepared by adding two teaspoonsful of extract of lead, and one large spoonful of strong camphorated brandy, to one pint of water; the whole is to be well shaken together, and set apart for use.

CHAPTER II.

ON THE DISEASES PECULIAR TO OXEN AND COWS.

OXEN are subject to few maladies, exclusive of those incident to neat cattle in general, unless the effects produced in these animals by the ox-fly, breeze, or gad-fly, as it is variously termed (the *Œstrus bovis* of Linnæus). This insect has spotted wings, and a yellow breast; it is furnished with a long proboscis, armed with a sharp dart, inclosing two others within it. The gad-fly particularly infects oxen, in the backs of which these insects deposit their eggs, and in which the maggots are nourished during the month of June: throughout the summer they plague the cattle by means of their darts to such a degree, that they are often induced to rush into the water for relief, till the approach of night. It has been suggested, that the production of these terrible insects might be greatly checked, if not prevented, by washing oxen and cows (which are sometimes attacked by these vermin) in the spring, with a decoction of tobacco, or any other bitter and acrid vegetable.

Cough, or *Hoosing*.—This disease may be easily known, by the shortness of breath and difficult respiration that invariably accompany it. Sometimes it arises from extraneous matters adhering to the throat, which, resisting the powers of mastication, produce an unusual tickling in that part; but more commonly it originates from cows taking cold while calving. A regular supply of sweet, succulent food, together with warm housing, (especially during the winter,) is the only certain remedy that can be depended upon in this case; though some

have recommended one ounce of pulverized aniseed, a similar quantity of tar, and of vinegar of squills, to be infused in a quart of warm ale, sweetened with honey. With this liquor the animal must be drenched every day for several weeks, otherwise no beneficial effects can be expected to be derived from such treatment.

The *Puerperal*, or *Milk Fever*, is chiefly occasioned by cows taking cold while calving. Hence it becomes particularly necessary to watch them when near their time of calving, as many valuable beasts are lost for want of due attention to this circumstance. Cows thus affected should be taken into the house: they should be allowed plenty of dry litter, and in other respects generally treated as in the case of violent colds, excepting that no blood must, on any account, be drawn, unless in cases of extreme necessity.

Affections of the Udder.—The udders of young cows, that are in high condition, are sometimes greatly swollen and inflamed for several days before they calve, in which case it will be proper to milk them repeatedly, and alternately to anoint the distended udders with cooling ointment and brandy. Beside these swellings, the udders of cows are liable to injuries, which are often of serious consequences, by falls, blows, wounds from sharp or pointed instruments, by the violent sucking of calves, and also from the injudicious or rough treatment of harsh or inexperienced milkers. While the inflammation remains in an indolent state, the parts affected ought to be repeatedly anointed in the course of the day with fresh butter, or with a salve, consisting of one ounce of Castile soap dissolved in one pint and a half of new milk over a moderate fire, constantly stirring it till it be thoroughly incorporated. An ointment, prepared from the juice of the leaves of the common thorn-apple, (*Datura Stramonium* of Linnæus,) mixed with hog's lard, is likewise said to be an excellent application for swollen udders; or, the tumour may be anointed with a little mixture, consisting of camphor and blue ointment, about half a drachm of calomel being given in a hornful of warm beer, for three or four mornings, if the malady continue to increase. Where, however, the udder and teats are considerably inflamed, internal remedies should be resorted to: for this purpose it has been recommended to mix four ounces of nitre with one pound of common salt, and to give two table-spoonsful of the powder in a gallon of thin water-gruel every three hours.

But in case the disorder should, from neglect, have made such progress as to exhibit hard tumours, the following fomentations may be applied: let one handful of common hemlock (*Conium Maculatum*, L.), a similar quantity of the dwarf or round-leaved mallow (*Malva rotundifolia*, L.), and the same portion of common melilot (*Trifolium melilotus officinalis*, L.), be boiled in a sufficient quantity of water, and diligently applied, as warm as the beast can bear it. As soon as the tumour opens, let the sore be properly cleansed, and then cover it with a plaster of Turner's cerate, or of basilicon ointment. The following remedy has also been successfully employed in obstinate cases of ulcerated udders, viz.:—

> Take gum ammoniac and gum galbanum, Castile soap, and extract of hemlock, of each one ounce; form them into eight boluses, one of which should be given every morning and evening.

Lastly, where the teats only are sore, they may be washed with clean, warm soap-suds, and rubbed with an ointment consisting of pulverized ceruse, or white lead, that has previously been saturated with brandy, mixed with a sufficient quantity of goose grease, or elder ointment.

Such are the diseases incident to cattle, that are of most ordinary occurrence: for an account of the more dangerous maladies of inflammations of the liver and lungs, locked-jaw, yellows or jaundice, &c., we beg to refer our readers to Mr. Clater's work entitled "*Every Man his own Farrier*," already noticed: and for instructions in cases of difficult birth, to that of Mr. Skellett, "*on the Parturition of the Cow.*"

CHAPTER III.

ON THE DISEASES OF CALVES.

Scouring, or *Looseness*, is generally the first malady that attacks calves; it is mostly, if not entirely, occasioned by the inattention of the persons to whose care the sucklings are committed, and who often put them too soon to suck, allowing them to remain longer at the teat than is proper: too frequent

change of milk will likewise produce this disease. As soon as the looseness is discovered, it has been recommended to stint the calf in its diet, and to give an egg, boiled hard and chopped small, by drenching, fasting; the use of which, once or twice, is asserted in most cases to effect a cure. A mixture of pulverized chalk and wheat-meal, made into balls with gin, has also been recommended as a medicine which may be administered with safety.

The *Shoote* is a most fatal malady to calves, which it generally attacks a few days after birth. The usual symptoms are, first, a colic that is more or less violent, and is frequently very severe and dangerous, especially when it is contagious. This colic is terminated, and the calf relieved by a discharge taking place from the bowels; though this sometimes proves fatal before the shoote appears. Secondly, a loathing and refusing of food, even previous to the discharge, which decreases and increases according to the duration and violence of the disorder. Where the *shoote* prevails, the cheapest, and perhaps the best medicine which has been generally administered by experienced breeders is, eggs and flour properly mixed with oil, melted butter, and aniseed, linseed, or similar mucilaginous vegetables; or, simply, milk well mulled with eggs, may be given to the distempered animal.

The *Cords* is a disease chiefly prevalent in Scotland, where it attacks calves during the first days or weeks after they are produced, and proves particularly fatal to such as are fed by hand and confined; though, if they outlive five or six weeks, they are seldom in any danger. The disorder appears to be of a plethoric and inflammatory nature, as the calves that die in consequence of it are extremely red; and the small leaders, or ligaments, are much contracted, whence probably the disease has its name. With the view to prevent the occurrence of the cords, it has been recommended to purge off the meconium, or first excrement, by giving the calf a little of the mother's milk, lukewarm, as early as possible, care being taken that no cold milk be given the animal for the first six weeks. And, in order to counteract or reduce the disorder, it will be advisable to turn them out every day for a few hours, as soon as possible after they are calved, in order that they may enjoy the benefit of full and free exercise in the open air; but where the weather or other circumstances may not allow this always to be done,

(and especially as confinement is necessary to their speedy fattening,) the most effectual preventive will be frequently to take a little blood from them.

Cough.—Where calves are exposed at too early an age to *all* the vicissitudes of the weather, before they acquire sufficient strength to undergo the changes of this climate, they are liable to take frequent colds; the consequence of which is a *cough*, that often proves fatal if it be neglected. For curing this malady, it has been recommended to pour half a tablespoonful of spirit of turpentine into the calf's nostrils, which must be held upwards, in order that the turpentine may flow into the throat: at the same time, the nose should be smeared with tar, and the animal kept within doors for a few hours, repeating this treatment as often as the cough is troublesome.

3. The *Gut-tie*, chiefly prevails in the county of Hereford, where it is considered as the effect of an erroneous method of castration, which causes a stoppage in the bowels, and brings on a mortification that speedily proves fatal. The symptoms are a total stoppage in the bowels, except a copious discharge of blood and mucus, accompanied by a violent fever, which occasions the calf to kick at its belly, lie down and groan. The gut-tie mostly affects calves, though they may live to be full aged, and yet be liable to a sudden attack of this distemper. The manner in which a cure is effected in the county abovementioned is, to make a perpendicular incision four inches under the third vertebræ of the loins, over the paunch, or stomach, and to introduce the arm, in order to discover the part affected, the beast being kept, if possible, in an erect position by the help of proper assistance. The following draught is given, in order to remove the stoppage of the stomach occasioned by the *gut-tie*, and to carry off the fever:—

Senna	1 ounce.
Cream of tartar	2 ounces.
Glauber's salts	4 ounces.

Infused in two pints of boiling water, with the addition of half a pound or pint of salad oil, the whole being worked off with gruel, in which mallows and alder bark have been infused.

CHAPTER IV.

ON THE DISEASES OF HORSES.

Of all domestic animals, the horse is, perhaps, more liable to disease than any other; and this is not to be wondered at, when we consider the toil he is frequently forced to undergo, the brutality with which he is often treated, the tender age at which he is very generally compelled to work, and the improper treatment he commonly meets with from those even who are most desirous of using him well, and who, in most instances, err through ignorance.

As in all cases of disease, we should recommend early application to be made to a skilful veterinary surgeon, it is not our intention to go into any very lengthened detail of the maladies of horses generally, but merely to give a summary account of the symptoms and treatment of the most common diseases to which these useful animals are subject, in order that the farmer may, on any sudden emergence, be enabled to detect the nature of the complaint which he has to contend with, and to administer those medicines most conducive to its removal.

Botts are short, thick, reddish worms, surrounded by small prickles, and are armed with two hooks or claws, by means of which they attach themselves firmly to the horse's stomach, where they frequently exist in such quantities as to cause many serious diseases, not only of the viscus in which they are lodged, but also of the brain and nervous system; with which the stomach is well known to sympathize.

These worms may occasionally be found sticking about the fundament, generally towards the close of autumn, or when a horse is first taken up from grass. Common oil, given fasting in doses of from half a pint to a pint, has been known to succeed in destroying these insects; but as good a method of getting rid of them as any is to keep the horse fasting during the night, and in the morning to give him about a pint of warm milk, sweetened with honey; and, five or ten minutes after, a

drench composed of one quart of warm water or thin gruel, and four or five ounces of common salt.

Several other species of worms exist in the bowels of the horse, and are not unfrequently met with even in the large blood-vessels. The most efficacious mode of destroying them, is to give one or two drams of calomel at night; to keep the horse fasting, and in the morning to administer the following ball:—

Barbados aloes	5 drams.
Ginger	1½ dram.
Oil of Caraways	15 or 20 drops.
Castile Soap	3 drams.
Syrup enough to form the ball.	

Or a drench made by dissolving four or five ounces of common salt in a quart of thin gruel, and three or four ounces of olive oil. Previous to physicking a horse, he should be kept on warm bran mashes for a couple of days; and care must be taken, after giving the medicine, that he be not exposed to cold or wet, or allowed to drink cold water. A run at grass is perhaps the best remedy for worms; and where this cannot be had, soiling on green food will be found beneficial. Oil of turpentine in doses of three or four ounces in a pint of gruel, is a very efficacious remedy for worms.

Colic is generally produced by an overloaded stomach; which, impairing the digestive process, causes a great quantity of air to be formed, which distends the stomach and intestines, and produces those symptoms hereafter to be noticed. It is also frequently induced by allowing a horse to drink cold water or hard well water, or by feeding him on new oats or hay. As this disease, (which is generally termed flatulent or spasmodic colic, gripes, fret, or gullion,) unless relieved, is liable to terminate in inflammation of the intestines, it may perhaps always be proper to bleed to the extent of two or three quarts; to unload the bowels as much as possible by hand-raking; and to administer a clyster made of half a pound or more of common salt, and five or six quarts of warm water or gruel; to which may be added half a pint of olive oil. Then a carminative drench may be given; and gin and water, or brandy and water, are perhaps as good medicines as can be had for this purpose, and possess the advantage of being generally at hand. Four ounces of spirit to twelve of water, are the proportions in which they may be used; that is, one pint of spirit and water should contain one fourth

spirit and three fourths water. Should the animal not appear relieved in the space of half an hour, the above remedies may be again resorted to with greater freedom.

The symptoms of colic are as follow: the horse appears restless and uneasy; frequently paws his litter; looks round at his flanks; endeavours to strike his belly; falls down; rolls on his back; gets up suddenly, and after a short time falls again, with other demonstrations of extreme pain. The mode of distinguishing an attack of colic from inflammation of the bowels, will be seen by referring to the symptoms of the latter complaint, under the head "Inflammation."

Cold or *Catarrh.*—This disorder is generally induced by exposing a horse to cold or wet, while in a state of perspiration. Its symptoms are dulness and watering of the eyes, cough, discharge from the nostrils, sore throat, quickness of breathing, general lassitude and accelerated pulse. (A healthy horse's pulse beats from thirty-six to forty strokes in a minute.) As catarrh is an inflammatory complaint, it is proper in the first instance to bleed largely: five or six quarts of blood may be drawn, unless the animal become faint before that quantity be abstracted. The diet should consist of bran mashes, containing a small quantity of nitrate of potash, (about half an ounce,) three times a day; and the horse should be kept in a cool stable, or loose box, or turned into a paddock. When the throat is very sore, an emollient drink, composed of decoction of marsh-mallows, or linseed with mucilage of acacia and liquorice, may be given. When catarrh terminates in chronic cough, the best remedy is attention to diet, exercise, and grooming. The horse should never be allowed to overload his stomach, especially with hay; his bowels should be kept moderately open by means of bran mashes or clysters, when requisite, and if the secretion of urine be faulty, it may be increased by small doses of nitre. A variety of medicines have been prescribed for chronic cough; as powdered squills and gum ammoniac, one dram of the former to three of the latter, made into a ball with castile soap, liquorice powder, and syrup; or a powder composed of two drams of levigated antimony, the same quantity of nitre, and three drams of powdered resin, to be taken every morning in a mash until it acts as a diuretic. The following drench may sometimes be found useful.

Take one ounce of bruised squills, three of garlic, and twelve

of vinegar: macerate the squills and garlic in the vinegar for one hour in a moderately warm oven; then strain off the liquid and add one pound of honey or treacle. Three or four ounces of this mixture may be given at a time in bad coughs; and when great irritation appears to exist above the windpipe, one teaspoonful of tincture of opium may be added to every dose.

Grease. This disorder consists in a discharge of stinking matter from the heels. On its first appearance the horse should take a dose of physic, and be kept on bran mashes, containing a little nitre. The leg should be enveloped in a large, warm, emollient poultice; and this treatment should be continued until the pain attendant on the complaint be removed, after which the parts may be washed with a solution of blue vitriol. In very inveterate cases, requiring stronger applications, the following lotion may be used instead of the vitriol:—

Corrosive Sublimate.....	1 dram.
Muriatic acid.....	3 drams.
Water	1 pint.

When the disorder has been cured, there will generally remain some swelling of the part, for which bandages are the best remedy.

Inflammation. Under the term inflammation may be classed fever, or general inflammatory action of the whole system, as well that which is confined to particular parts, as the brain, lungs, liver, bowels, &c. In all attacks of inflammation, there is a quickened pulse, heat, and redness of the inner membrane of the eye-lids; the horse is generally dull, and unwilling to move, except in inflammation of the brain, or mad staggers, when he is extremely violent and dangerous to approach; the urine is in most instances scanty and high coloured; the dung voided in small knobs, frequently covered with slime. In addition to these general symptoms, the breathing is laborious and oppressed in cases of pleurisy or inflammation of the lungs, as may be seen by the heaving of the flanks, and the dilatation of the nostrils; and in inflammation of the bowels, the horse, besides manifesting signs of being griped, appears for some time dull and heavy, then becomes restless, as in cases of colic, his breathing is sometimes disturbed, his pulse quick, the inner surface of the eye-lid red, the extremities cold, and the appetite lost. If not speedily relieved, the griping becomes so severe that

he breaks out into profuse sweats; and at length, mad with pain, becomes violent, and dangerous to approach. In all cases of inflammation, bleeding to a large extent, from six to eight quarts, according to the violence of the attack, is essentially necessary; and this, if the symptoms do not subside, must be repeated. The bowels should be hand-raked, a clyster injected, and a dose of physic administered with the usual precautions. Diuretic balls may also be occasionally given, when the disorder begins to give way, and the diet should consist entirely of bran mashes. When the inflammatory attack has been subdued, a run at grass is the best mode of recruiting the strength. In inflammation of the kidneys,—which may be known by the horse constantly endeavouring to stale, without being able to effect any evacuation, or at most to void but a small quantity of high coloured, bloody urine, and by a stiffness of one or both hind legs,—the treatment, in addition to the bleeding and purging already recommended, may consist in covering the loins with a fresh flayed sheep's skin, the wool side outwards, and giving emollient drinks, as decoction of marsh-mallows, with mucilage of acacia, or decoction of linseed with gum arabic. Inflammation of the bladder may be treated in the same way as inflammation of the kidneys; but it is not necessary to abstract as much blood as in the latter complaint, nor is the sheep's skin requisite: its most prevalent symptom is a frequent emission of a small quantity of urine, which being of an acrimonious nature, causes acute pain.

Broken Knees. The best application to broken knees, is a large poultice until the inflammation be completely removed; after which the injured part may be covered with a paste made of equal parts of powdered alum and pipe clay, with sufficient water to reduce it to the consistence of cream. This should be bound on, and suffered to remain for two days, when it may be renewed. Should there be any flap of skin, it is to be cut off; for, being bruised, it will rarely unite. Gunpowder and hog's lard, or tar ointment, (made by boiling together equal parts of tar and tallow,) may be used to promote the growth of hair.

Bruises should always be poulticed, or fomented with hot water. A towel dipped in greasy water is a good application.

Galls. When a horse is galled by the saddle or harness, or when he is chafed between the arm and chest, an accident which

frequently happens in travelling through muddy roads, the following lotion will be found serviceable:—

Sulphate of zinc	1 ounce.
Super-acetate of lead	1 ounce.
Water	1 quart.

Strains. The best method of preventing the inflammation attendant upon a strain is, immediately on the receipt of the injury, to bleed and wrap the injured part in a large poultice. The horse should then be physicked and kept to a low diet. Some people, instead of poultices, employ cold applications; as

Super-acetate of lead	1 ounce.
Vinegar	4 ounces.
Water	1 pint.

Their effect is the same as the poultice; each tending to reduce inflammation. On the whole, we are inclined to give the preference to the poultice. When a strain is neglected for some time, and the inflammation has gone off, bleeding will be improper. Blistering, and, in some cases, firing must be resorted to. There are several sorts of strains; as strains of the back sinews, of the pastern joint, of the shoulder, loins, hip, &c.; but our limits do not permit us to give a detailed account of their different symptoms. The rationale of their treatment is in all cases the same.

Teeth. Sometimes the grinding teeth of horses become worn in such a way as to wound the inside of the cheek, and prevent the mastication of their food. In such cases, the edges should be filed down, and the wounded cheek rubbed with salt.

Strangles. This is a disorder which happens to horses between their third and fifth year. It consists in an inflammation of the tonsils, terminating in an abscess under the jaws, and, when it occurs at grass, is generally of a mild nature. The swelling should be poulticed until it breaks or becomes sufficiently ripe to be opened with a lancet. When the throat is very sore, some blistering liniment should be rubbed in, and, in severe cases, where inflammation of the lungs is apprehended, bleeding is requisite. The horse should be kept in a cool place.

Lampas. This is a swelling of the roof of the mouth, and is caused by cutting the grinding teeth. It is a common practice

with farriers to burn the swollen part with a hot iron; a cruel and unnecessary operation, arising from ignorance of the causes producing the complaint. If anything be done to it, the swelling may be rubbed with salt or a solution of alum; but the best thing is to keep the horse on mashes or other soft food for a few days, when nature will effect a cure.

The following Prescriptions will be found useful on many common occasions:—

CORDIAL DIURETIC BALL.

Common turpentine	3 drams.
Hard soap	3 drams.
Powdered ginger	1 dram.
Do. allspice	1 dram.

Liquorice powder enough to form a ball.

DIURETIC POWDER.

Powdered rosin	4 drams.
Nitre	4 drams.

STOMACHIC BALL.

Powdered gentian	3 drams.
Do. ginger	½ a dram.
Do. allspice	½ a dram.
Carbonate of soda	1 dram.

Treacle enough to form a ball.

Or,

Powdered cascarilla	2 drams.
Myrrh	1 dram.
Ginger	½ dram.
Castile soap	1 dram.

Syrup enough to form a ball.

Or,

Powdered columbo root	½ an ounce.
Do. Cassia	1 dram.
Do. Rhubarb	3 drams.

Syrup enough to form a ball.

CORDIAL DRENCH.

Good old beer or mild ale	1 pint.
Grated ginger	1 dram.

EXPECTORANT BALL.

Gum ammoniac	2 ounces.
Powdered squills	1 ounce.
Do. opium	½ ounce.
Do. ginger	2 ounces.
Balsam of sulphur	4½ ounces.
Castile soap	2 ounces.

To be divided into twelve balls, and one to be given every morning and evening, in cases of severe cough, the bowels having been previously emptied by physic.

FRIAR'S BALSAM.

Benzoin	1½ ounce.
Storax balsam (strained)	1 ounce.
Balsam of tolu	½ ounce.
Aloes	2 drams.
Rectified spirit	1 pint.

DIAPHORETIC ALTERATIVE.

Levigated sulphuret of antimony,	3 to 6 drams.
Anise seeds	½ ounce.

ASTRINGENTS.

Powdered catechu	3 drams.
Alum (purified)	3 drams.
Powdered opium	1 scruple.
Do. ginger	1½ dram.
Prepared chalk	2 drams.

Or,

Opium	½ dram.
Powdered ginger and powdered oak-bark .. of each	½ ounce.

BLISTERING LINIMENT.

Olive oil	4 ounces.
Oil of origanum and oil of turpentine ..... of each	1 ounce.
Fresh powdered Spanish flies	1 ounce.

LIQUID BLISTER.

Powdered Spanish flies	1 ounce.
Boiling water	½ pint.

After allowing the mixture to stand for a day and night, add,

Rectified spirit of wine	4 ounces.
Oil of origanum	1 ounce.

LINIMENT FOR THRUSH OR CANKER.

Melted tar	2 ounces.

Muriatic acid ..... 3 drams.
Verdigris ..... 2 drams.
Mix and stir till cold.

Or,

Melted tar ..... ½ pound.
Strong sulphuric acid..... 1 ounce.

For further particulars, we refer with confidence to "*White's Farriery*", and also to his very useful "*Dictionary of the Veterinary Art.*"

CHAPTER V.

ON THE DISEASES OF SHEEP.

SHEEP are subject to various disorders, of which, however, our limits allow us only to state those of most frequent occurrence; hence we shall, for the present, briefly remark, that it may be easily ascertained whether these animals are in health, or diseased, by their agility and briskness; the clearness of their eyes, which, as well as their noses, should be perfectly dry; by the sweetness of their breath; the coolness of their feet; regularity of perspiration; the fine pink colour of their skin; soundness and firmness of their teeth; and by the uniform, unbroken texture of their wool.

Blindness.—This affection of the eye is produced by exposure to cold, particularly in too moist or too elevated situations; and is occasioned by long continued fatigue, which will produce it, at any season of the year. It prevails chiefly in Scotland, where a cure is sometimes attempted * by opening the angular vein of the eye, and holding the animal's head in an inverted position, so that some drops of blood may fall into the eye. This moderates the increased action of the vessels of that part, which is the immediate cause of inflammation; and also the blood, being so admitted into the creature's eye, will, in consequence of its mildness and warmth, produce emollient effects, which likewise contribute to promote a cure. This

* Agricultural Report of the County of Perth, 8vo ed.

operation completely removes the white specks on the eye, and restores the sight; though some for this purpose pulverize a small quantity of glass, and blow it into the eye by means of a quill open at both ends, which, by its friction, wears off such specks or scales. "But the enjoyment of ease will infallibly cure them in a space of time proportioned to the fatigue they underwent before." *

The *Blood* is a fatal malady to sheep, which often die suddenly in consequence of it: in less violent attacks the symptoms are, panting and heaving of the flanks, and standing still. It is produced by feeding on too succulent or moist pastures. The most effectual remedy is bleeding; after which the animal should be turned into a dry pasture, and a mixture of common salt and nitre with bran may be given to it.

Dunt.—This disease is variously known by the names of staggers, giddy, vertigo, turn, sturdy, and bladder on the brain. It is occasioned by a vesicular collection of water in the head between the *dura* and *pia mater*, and uniformly produces a continual giddiness. The violently pulling of sheep by the ears, which are afterwards cut off, is said to have effected a cure: but the most frequent remedy is that of *trepanning*; a hazardous operation, which can only prove successful in the hands of skilful persons. In Saxony, several of the sheep-owners keep their lambs in the folds during their first year; having remarked, that such as are kept from the fields during that time, are very rarely attacked with this disorder. In Prussia, M. Lasteyrie states, that he had been assured, by many agriculturists, that they had secured their flocks from the turn, by fastening a linen cloth covered with pitch on the heads of the lambs, previously to conducting them into the fields. This kind of cap, they maintain, prevents the intromission of the worm which the flies deposit in the frontal sinus, during the earliest youth of the animals. A fact so important as this certainly deserves to be positively ascertained; we have, therefore, stated it for the consideration of our readers.

The *Flux* is a diarrhœa, or looseness, that attacks sheep which suddenly come to full feed, after having been stinted with food; though it is sometimes by their eating the plant known by the names of may-weed, mathen, or fetid chamomile

* Hogg's Shepherd's Guide, p. 118. 1807.

(*Anthemis cotula* of Linnæus). In general, the flux is not attended with any dangerous consequences, and usually disappears in the course of a few days, in dry weather. Should it, however, continue longer than a week, it will be proper to give them some well-dried, sweet hay, and a decoction of clover flowers, with the addition of a little barley meal; allowing them neither any salt, nor to feed on any saline plants near the coast. But it is evidently the farmer's interest to give these useful animals a regular supply of food, as the weakness occasioned by the flux must necessarily reduce their condition.

The *Fly*.—This disorder is chiefly confined to sheep that are continually exposed in hot seasons, particularly in inclosed woody districts. The insects from which the disease derives its name, live among the wool, where they materially prevent sheep from thriving, from the severity with which they bite. Hence various remedies have been suggested, most of which, however, are in some degree injurious to the wool. Flour of sulphur, mixed up with butter, lard, or other unctuous substances, and rubbed in with the hand, have been found least hurtful to the quality of the wool; and the remedy, suggested by Sir Joseph Banks for the *scab* in sheep, hereafter described, may be applied in the present case. When, however, maggots are formed, they should be carefully scraped from the wound, to which turpentine and brandy, mixed together, may be applied. Mr. Marshall * directs such maggots to be picked out with a knife, or otherwise removed, without breaking the coat, when a quantity of white lead is to be scraped among the wool, which being agitated, the powder is carried evenly down to the sore. But due attention must be given, that too much ceruse be not applied, as it will discolour the wool; while a small quantity prevents any further injury from the maggots remaining among it, as it drives them away from the wound, the healing of which it promotes at the same time. Mr. Priest, an intelligent chemist of Norwich, has prepared a cheap liquid, that not only cures where the fly has already struck, but also prevents its future attacks. It has been very extensively and successfully used by the Norfolk sheep-farmers.

The *Foot-halt*, as its name announces, is peculiar to the feet of sheep. It is occasioned by an insect resembling a worm,

* Rural Economy of the Midland Counties.

two, three, and sometimes four inches long. It is indicated by lameness, which often increases to such a degree as to prevent the animal from grazing. From pain and want of appetite, the sheep languishes, till at length it falls a victim to the disorder, unless the worm be opportunely extracted.

As soon, therefore, as a sheep is observed to limp, the lame foot ought to be examined between the close of the claws, where the skin is found perforated, through which the worm has worked its passage upwards, between the external membranes and the bone. In order to extract the insect, it will be sufficient to move the claws in contrary directions, backwards and forwards, till the worm gradually makes its way to the surface. This simple expedient is far preferable to the operation of drawing out the insect, as in the last case there is always danger of its breaking off, and rotting in the leg of the sheep, which will thus be materially injured. As the foot-halt occurs more frequently in wet than in dry seasons, and generally in the spring and fall, but rarely in summer and winter, it may be prevented, in most cases, by pasturing sheep in dry and healthy grounds, rather than in low meadows or marshy soils.

The *Foot-rot* is another disease peculiar to the feet of sheep, and if it be not quickly eradicated, generally proves contagious. It arises, in general, from sheep feeding on long, rank grass, in wet seasons; but inattention to cleanliness will also produce the foot-rot as well as the foot-halt.

This disease is known by lameness, which increases as the foot-rot becomes more inveterate, by the oozing of a disagreeably fetid matter from between the claws, and by the appearance of proud flesh in the more advanced state of the malady; at length, if it be not timely discovered, the foot becomes so completely mortified by the cancerous humour corroding every part of it, as to become incurable, in which case the skin is the only valuable part of the animal. It is remarkable throughout the progress of this disease, that sheep retain their appetite, and apparently feed as well as when in perfect health; though they very soon fall away, and continue declining till they have lost all their fat. Their appetite, however, remains till the very last stage; and instances have occurred in which they have been so eager as even to crawl on their knees for food.

Various remedies have been tried and recommended for the cure of this contagious disorder, of which the following appear most deserving of notice. As soon as the disease is discovered, the sheep should be separated from the rest of the flock, and the part affected pared and cleansed, so as not to touch the quick, and at the same time to remove the gravel, if any should be there contained; after which either of the remedies subjoined may be applied :—

Mix four ounces of the best honey, two ounces of pulverized burnt alum, and half a pound of powdered Armenian bole, in such a quantity of train or other fish oil as will make the various ingredients of the consistence of salve. The honey should be first dissolved gradually, and the bole carefully stirred in, and then the alum and oil are to be added.

Or,

Reduce three ounces of verdigris, four ounces of alum, a similar quantity of vitriol, one ounce and a half of white mercury, and one ounce of white copperas, respectively into fine powder, and gradually dissolve the whole into one quart of white-wine vinegar.

It may be proper to observe, that the former remedy was invented by Mr. George Culley; and the latter by the late eminent Mr. Bakewell. In Mr. Young's opinion *, the salve is more efficacious than the liquid, having in one or two cases effected a cure where the latter had failed; but Mr. Y. states, that he uniformly employs Mr. Bakewell's remedy before the animals are anointed with Mr. Culley's salve. The following have also been tried with success :—

Two ounces of roche-alum, a similar quantity of blue vitriol, one ounce of verdigris, and a quarter of an ounce of animated quicksilver, dissolved in a quart of good distilled vinegar; to be dropped on the diseased part, care being taken to keep the feet dry, and clean from all dirt or filth.

Or,

When a sheep is first observed to be affected, let it be brought in, and the sore foot well washed with soap and urine; then well bathed with turpentine, and afterwards rubbed all over with tar, and bound up with flannel; and if it be then turned into a clean dry pasture, the cure is certain †.

In some observations on the nature and cure of this malady, communicated to the Board of Agriculture by R. Worthington,

* Annals of Agriculture, Vol. XXI.

† Hogg's Shepherd's Guide, p. 170.

Esq. of Southend, the fact of its being contagious is clearly established; and the following method of treatment is stated to be that which has proved most successful. It consists, first, in perfectly cleansing the feet with soap and water; then, in scraping with a knife, and occasionally cutting off the foul and putrid portion of the foot, whether of the interior softer parts, or of the hoof. After this, the bloody surfaces are to be scoured with a mixture consisting of equal parts of muriate of antimony, tincture of benzoin, and tincture of myrrh; and a little muriate of antimony alone is directed to be applied with a hair pencil to the more ragged and diseased parts. To the practice of muffling the feet, in order to keep them dry, Mr. W. objects most decidedly; because, if the land be wet when the sheep are turned out, the feet will suffer more from absorbed damp, than if they were not covered at all. He considers it preferable to give them food and lodging under an appropriate shed, or in some convenient out-house; and, at all events, directs that they should be kept on some dry treading, for an hour or two, after every dressing. The practice here described, Mr. W. asserts, will always put a stop to the progress of the foot-rot*. *Lime* has also been found an efficacious remedy; and may be advantageously applied to whole flocks by spreading it on their pasture. In corroboration of this fact is one mentioned in the Agricultural Survey of Devonshire †, of one lot of sheep having been divided between two persons, one of whom turned his proportion into a field recently covered with a full dressing of caustic lime, where they remained perfectly sound; while the other portion were much infected with the foot-rot.

The following mode of treating this troublesome malady was communicated to the Society of Arts by Mr. Richard Parkinson of Walworth, who was honoured with their silver medal for it. In sheep thus affected, he directs the hoofs to be pared, leaving no hollow to hold dirt: if matter be formed, it must be carefully discharged, after which the feet must be washed clean from dirt with some stale urine, and wiped with a sponge. The sheep are next to be put into a house or shed, the floor of which has been previously spread, about two inches thick, with

* Communication to the Board of Agriculture, Vol. VII. Part I.
† Vaucouver's Survey, p. 341.

quick-lime reduced to powder by a small quantity of water. The fresher the lime is, the better. Upon this, the sheep are to stand for six or seven hours, and the cure will be effected*.

Gall, or *Scower*.—This disease prevails chiefly during winter, and is supposed to be produced by severe frosts. An immediate change to dry food is the best remedy that can be resorted to; and it appears from the practice of Mr. Ellman, that if some hay be given to sheep on those mornings when hoar frosts are upon the ground, it prevents them from being attacked by the gall.

Hoven or *Blown*. See the first Chapter of this Book.

The *Hunger-rot*, is generally occasioned by poor living, especially from a scanty supply of winter fodder. It may easily be known by the leanness of the sheep. An immediate change of keep is the proper cure.

Pelt-rot.—In this disorder the wool or hair falls off spontaneously from the sheep. Scanty keep, exposure to much wet, or sometimes a sudden change from poor to full feeding, will variously produce the pelt-rot, which is likewise occasioned by the *scab*. In the last case, the removal of that disease will of course effect a cure; but in the former instances, as soon as a sheep is discovered to be affected, (if not too far gone,) it should be separated from the flock, and driven into a detached yard, where the diseased part should be cleansed, and the animal anointed with a mixture of turpentine, lard, or other grease, and tar, in such proportion as to form a salve, (a piece of cloth being sewed on the animal to keep it from the cold;) and where they should be supplied with the best food, an attentive regard to the regular distribution of which, especially in winter, would effectually prevent this malady.

Red-water.—This malady is sometimes called the *resp*, and is believed to originate from sheep feeding too freely on turnips, clover, or other rich and succulent vegetables. Frequent driving about, and the use of common salt, are said to be successful remedies in the red-water, which, it is asserted, may be *prevented* by giving the animals dry provender, in the course of the night, after they have been feeding on the vegetables above mentioned. The use of parsley in this malady is likewise said to be beneficial.

* Transactions of the Society of Arts, &c. Vol. XXVI. pp. 126, 127.

"This disease commonly makes its appearance about the beginning or end of winter, and first affects about the breast and belly, although at times it spreads itself over other parts of the body. It consists in an inflammation of the skin, that raises it into blisters, which contain a thin, reddish, and watery fluid. These continue for a short time, break, and discharge their matter, and are followed by a blackish scab.

"When the sheep are exposed to cold or wetness, the skin being fretted, makes the blisters rise; or they often arise from cold affecting the animal internally; thus producing a slight fever, which throws out these vesicles on the body, similar to the scabby eruptions which appear about the face, and more particularly about the mouth, of persons affected with cold. The blood in this disease is but little affected, although a little of it oozes into the vesicles on the skin, and communicates to them that reddish tinge, which gives origin to the name.

"Red-water is a disease that but rarely appears in this country, and is seldom fatal. In cases where the disease is violent, a little blood should be taken. The sheep should be placed in a fold by itself, the blisters slit up, and a little infusion of tobacco put into them, and the following medicine may be given for three or four mornings successively:—

> "Take of sulphur two ounces, honey, treacle, or sirop, three ounces; mix them and divide them into six doses, of which one may be given every morning, in half a mutchkin of warm water.

If this is found unsuccessful, half an ounce of nitre, mixed with the foregoing receipt, will be attended with good effects; after which a dose of salts may be given, and the body washed with lime-water upon the parts affected."*

The *Rickets* occur chiefly in the county of Huntingdon, where they are supposed to have been introduced from Holland. Few diseases are more fatal than the rickets, the causes of which have never been precisely ascertained, so that no remedy applied for its removal has hitherto been attended with success.

The symptoms indicating the existence of this malady, are first, a species of giddiness, which renders the sheep uncommonly wild and fierce; starting up suddenly, and running, on

* Hogg's Shepherd's Guide, p. 183, &c.

the approach of any person, to a considerable distance, as if it were chased by dogs. In the second stage, a violent inflammatory itching in the skin takes place; the sheep rubs itself vehemently against trees, hedges, &c., so as to pluck off the wool, and even to lacerate the flesh; no cutaneous eruption ensues, nor does any discharge of matter follow, and every thing indicates a most ardent fever. In the last period of the rickets, the progress towards dissolution is very rapid, and the sheep, after reeling about, lying down, and occasionally taking a little food, at length expires.

This disorder is chiefly prevalent in the spring, and is hereditary; so that, after remaining concealed for one or two generations, it re-appears with increased violence. The rickets also appear *suddenly*, in consequence of which circumstance no precaution of the most judicious grazier can detect the malady; hence there is no alternative, but to cease breeding from such stock. We trust the attention of graziers and breeders will be more particularly directed to this formidable malady.

The *Rot.*—Few disorders have been more fatal to sheep, or have more frequently exercised the attention of graziers and breeders than the ROT; for the origin of which various causes have been assigned. Thus it has been attributed to fluke-worms, that breed in the livers of sheep, whither they are conjectured to be conveyed through the nostrils while the animals are grazing *; but these worms are evidently rather the *effect* than the cause of *rot*. The late Dr. Darwin suspected it to proceed from the inactivity of the absorbent vessels of the livers of sheep: so that their bile becomes too thin, particularly in wet or moist seasons. Dr. Harrison, in an interesting tract on the rot, is of opinion that it originates from *paludal effluvia*, or those unwholesome exhalations that arise from marshes; but to this suggestion salt marshes form a striking exception. And it is a fact, that in the county of Lincoln, in rotting seasons, the sheep fed on salt marshes, which are overflowed by the spring tides, sell at very high prices, from the confidence that they are safe. From an attentive consideration of every circumstance, it is evident, that superabundant moisture, either of food, (for experience has proved that even one half hour's feed-

* Letters and Papers of the Bath and West of England Society, Vol. I.

ing on moist or marshy lands, in hot weather, will produce it,) atmosphere, or situation, is the real cause of this dropsical malady; though it is certain, that the dry limed land in Derbyshire will produce it as well as meadows that retain water and stagnant marshes; so, in driving sheep to any distance, if they be suffered to lie only one night on a wet spot of ground, whether in an elevated situation or not, they are very liable to the rot.

The symptoms indicative of this fatal disease are thus accurately stated by Dr. Harrison, from whose very able "Inquiry into the Rot in Sheep and other Animals," we have selected them. "When, in warm, sultry, and rainy weather, sheep that are grazing on low and moist lands feed rapidly, and some of them die suddenly, there is reason to fear that they have contracted the rot. This suspicion will be further increased, if a few weeks afterwards the sheep begin to shrink, and become flaccid in their loins. By pressure about the hips at this time a crackling is sometimes perceptible. Now, or soon afterwards, the countenance looks pale, and, upon parting the fleece, the skin is found to have exchanged its vermilion tint for a pale red; and the wool is easily separated from the pelt. As the disorder advances, the skin becomes dappled with yellow or black spots. About this time the eyes lose their lustre, and become white and pearly, from the red vessels of the *tunica adnata* and eyelids being contracted, or entirely obliterated. To this succeed debility and emaciation, which increase continually till the sheep die; or else ascites, and perhaps general dropsy, supervene, before the fatal termination. These symptoms are rendered more severe by an obstinate purging, which comes on at an uncertain period of the disorder. In the progress of the complaint, sheep become what the graziers call chockered, i. e. affected with a swelling under the chin, which proceeds from a fluid contained in the cellular membrane under the throat.

"In five or six days after contracting the rot, the thin edge of the small lobe of the liver becomes of a transparent white, or bluish colour, and this spreads along the upper and lower sides, according to the severity of the complaint. Sometimes it does not extend more than an inch from the margin. In severe cases, the whole peritoneum investing the liver is diseased; and then it commonly assumes an opaque colour, interspersed

with dark red lines or patches. The upper part of the liver is sometimes speckled like the body of a toad, to which it is said to bear a striking resemblance; round the *ductus communis choledochus* and hepatic vessels, a jelly-like matter is deposited, which varies according to the severity of the attack, from a table spoonfull, or less, to five or six times that quantity. Upon boiling, the liver loses its firmness, and separates into small pieces in the water, or remains soft and flaccid.

"Several graziers and butchers, with whom I have conversed at different times, having observed that sheep are much disposed to feed during the first three or four weeks after being tainted, omit no opportunity of producing it, to increase their profits. When the first stage is over, flukes begin to appear in the *pori biliarii*, the *ductus communis choledochus*, and in the gall-bladder. At first, the quantity of these creatures is small; but, as the disease advances, they increase, and before death are often very numerous. In the last part of the complaint, they are sometimes to be found in the stomach, as well as in the intestines and liver. This, like the visceral disorders of the human body, may terminate in resolution, effusion, suppuration, or schirrus.

1st. "The complaint is said to terminate in resolution, when the inflammatory action goes off, without destroying the state and texture of the parts. However, I am strongly inclined to believe, that every considerable inflammation in the human body, and in other animals, although it ends in resolution, leaves behind it some remains, which may be discovered by an experienced anatomist. When the vessels are thrown into inflammatory action for a few days only, effusion commonly takes place, and the coats become thicker, and assume a buffy colour. These changes in the sanguinary system often continue through life, and lay the foundation of many chronic and incurable disorders. Sheep that recover from the rot exhibit very different appearances after death, according to the severity of the attack; but the taint is seldom or never entirely removed. I was desired, within these few days, to look at the liver of an old ewe, that died fat, and contained fourteen pounds of suet in her body. The back part of the small lobe was dappled with whitish spots; the coats of the *ductus communis* and *pori biliarii* were considerably thickened, and more solid than usual. In colour, they resembled the human *aorta*

in old people, and were full of flukes; in other respects the liver appeared to be sound and natural. The butcher asserted, that the variegated appearance and alteration in the ducts, were occasioned by a slight taint of long standing, which had not been considerable enough to disorder the economy, or impair the health of the animal sufficiently to prevent its feeding.

2dly. "When sheep die suddenly in the first stage of the disorder, an effusion of serum, or of wheyish-coloured fluid, may be commonly discovered in the cavity of the abdomen, and then the *peritoneum* surrounding the liver is generally covered with a membrane or coat of coagulable lymph. This form of the rot has been frequently confounded with the resp, or red-water, though it differs from the latter disorder in the colour of the effused liquid, in being much less disposed to putrefaction, and in several other particulars.

3dly. "Abscesses in the liver exhibit another termination of this malady. They are seldom considerable enough to kill immediately; but, in consequence of the absorption of purulent matter from them, the sheep frequently waste away, and die hectical or dropsical. When the collections are small, sheep will recover sufficiently to bear lambs, for three or four seasons, and afterwards become tolerable mutton.

4thly. "The most common termination is in schirri, or what the shepherds call knots in the liver; I have seen the whole substance of this important viscus so full of small, roundish lumps, or schirrous bodies, that it was difficult to find any sound part in it. The first attack is unfortunately so very insidious, that the disorder is scarcely observable, before the animal begins to waste and lose flesh. In this advanced state it is said to labour under the rot, or *pourriture*, from overlooking the commencement of the disorder."

Equally various with the conjectures respecting the origin of this destructive disease, are the remedies which have been recommended. The late eminent botanist, Miller, advised *parsley* to be employed as a preventive, which is eaten with great avidity by sheep, (the delicacy of whose flesh it greatly improves,) as instances have occurred where sheep, fed on parsley, remained sound, while those in the neighbourhood were affected with the rot: he, therefore, recommends sheep to be fed with that vegetable twice in the week, for two or three hours each time.

In places where the rot is usual, it will be advisable uniformly to fold sheep (where that practice is retained) before the dew falls, and to confine them in such folds till it evaporates, both in the spring and summer; feeding them with sweet hay, or other dry provender. In the Bath Papers already referred to, it is remarked, that no ewe is ever subject to rot while she has a lamb by her side; and it is there recommended, to place sheep that are affected with this distemper, so that they can get at the bark and young shoots of elder. Mr. Price (in the same practical work) advises every farmer to remove his sheep in wet and warm seasons, from such lands as are liable to occasion the rot; but, if this object cannot be obtained, he directs a spoonful of common salt, and a like quantity of flour, to be given to each sheep in a pint of water, once or twice in the course of the week, by way of preventive. And, in case the disease be in an incipient state, he is of opinion, that the giving of such a dose for four or five mornings successively will probably effect a cure; for the addition of the flour and water not only abates the pungency of the salt, but also disposes it to mix more gradually, and consequently more effectually, with the chyle. The late Dr. Darwin, however, conceived that salt would be more efficacious if it were combined with iron filings and flour, and made into a ball, to be given every morning successively for a week. Further, as a preventive, it has been recommended by Mr. Varlo, an experienced agriculturist, to give each sheep a spoonful of common salt once a week, when a "*rotting season*" is apprehended; and, when the animals are accustomed to it, he directs some dry salt to be laid on flat stones, in various parts of the pasture, as they will then lick it up without any further trouble.

A very extraordinary operation for the prevention of this most destructive malady, is practised by the German sheep-farmers; and the happy effects of which having, it is said, been incontestably proved, deserve the attentive consideration of every flock-master, though we feel compelled to doubt its efficacy. We refer to the *inoculation* of sheep for the rot, which produces in them the same effect as variolous inoculation does on the human frame. The inoculated animals contract the disorder, the symptoms of which are very mild, and the recovery from which is affirmed to be both speedy and certain. From the experiments which have been made, it has been proved,

that *inoculated flocks are protected from all contagion* *. Rams, tainted with the rot, have been coupled with inoculated ewes, which, together with the lambs that sprung from these embraces, have presented no symptom whatever of the rot. But this proceeds upon the principle that the rot is hereditary, which is far from being an admitted fact. Mr. White, indeed, asserts as much in his "Compendium of Cattle Medicine," but he afterwards qualifies the assertion by an opinion "that the disposition, or liability to the disease, is hereditary; and that disposition to the disorder is nothing more than constitutional debility." But there are many strong reasons to doubt the accuracy of that view of the subject, among which the fact, that if sheep bred from the same ram, be distributed partly upon dry pasture, and partly upon wet land, the latter will become infected, while the former will remain sound, appears to us conclusive; therefore, the disease is not constitutional; and if not, inoculation can be of no service.

The inoculation is performed by making an incision in the inner face of the thigh, from which the wool is stripped, about four fingers distant from the anus. The incision must penetrate the skin; but care should be taken not to wound any muscle, lest an effusion of blood should ensue. A pustule of an infected animal is next squeezed with the fingers; and, after taking away the virus thence issuing, on the point of a lancet, it is transferred to the wound of the individual which is intended to be inoculated.

Beside these *preventive* remedies, various medicines have been recommended to the attention of farmers and breeders; though we conceive, they can only be employed with probability of success in incipient cases. Of these remedies we select the following:—1. Put a handful of rue into a pailful of water in the evening, and on the following morning add such a quantity of salt as will make a brine strong enough to float an egg. Half a pint of this infusion is to be given, as a dose, every other day, for a week.—2. Infuse soot in strong brine and stale urine, and give each animal six or seven spoonsful for eight or ten successive days.—3. Ellis recommends a peck of malt, or more, to be mashed and brewed into twelve gallons of wort, in which a quantity of bloodwort, comfrey, pennyroyal,

* Lasteyrie's "Histoire de l'Introduction," &c. p. 193.

plantain, sage, shepherd's purse, and wormwood, are to be boiled; the liquor to be worked with yeast, some common salt to be added, when it is to be put into a cask for use. Of this medicated beer seven or eight spoonsful are to be given to each sheep, once in the course of a week during wet weather; but with longer intervals in dry seasons.

Among other remedies, we would here notice a patent which was granted to a Mr. Thomas Fleet, in October, 1794, for a medicine, which he affirms will not only prevent the rot in sheep, but also check the farther progress of the disorder in such as are already affected; *so as to render them capable of being fattened on the same herbage which produced the disease.* His restorative medicine consists of the following articles, the proportions of which, however, are *not stated* in the specification of his patent, viz. alkanet root, antimony, Armenian bole, bark, camphor, mercury, opium, salt, sulphur, turmeric, turpentine, and distilled water; which multifarious ingredients are simply directed *to be prepared according to chemical, and compounded according to medical art!* Not having had experience of the effects of this celebrated nostrum, we cannot say how far it answers the properties claimed for it by its inventor; but if the disease is to be cured, or prevented by medicine, a man, who includes the whole Materia Medica in his prescription, must certainly have a chance of success: so far, however, as our own experience goes, we would recommend sound pasture as the best *preventive*, and the butcher's knife as the only *certain cure.*

We shall conclude these remarks on the prevention and cure of this tremendous malady, with the following interesting observations selected from Dr. Harrison's valuable "Inquiry," already referred to:

"It is confirmed by experience, that whenever any place is laid dry by judicious management, it ceases to occasion the rot. For my own part, I am acquainted with many sound parishes, which, during their open state, were so injurious to man, and to other creatures, that I cannot sufficiently impress upon my readers the importance of effectual drainage, for the preservation of health. When, from circumstances, the land cannot be laid dry, during the summer months, it requires to be occupied with great caution, since moist grounds are the most prejudicial and dangerous to animal life. I have had

occasion to observe that miasmata are produced in some way or other by the sun's action upon moist ground, and, therefore, when it is well covered with grass, early in spring, we have less danger to apprehend, provided we maintain a deep herbage till the commencement of frosty weather.

" Mr. Young, of Claxby, is of opinion, that when land is well covered with grass it becomes less dangerous to cattle. In 1792, he divided a flock of sheep, and placed fifty upon some good aftermath, where, in other seasons, the rot had frequently prevailed. Only this part of his flock escaped the disorder, which he attributed to the meadow not having been grazed before it was well covered, and defended from the weather.

" Luxuriant pastures seldom rot, unless they be eaten bare in hot weather. Whilst the ground is well concealed, it is so completely defended and protected, that the sun exerts no deleterious effects upon it. In the fatal year, so often particularized, Mr. Elmhirst, of Bag Enderby, an experienced and zealous agriculturist, who occupied two hundred acres of land in the parish of Croft, near Wainfleet, sold all his heavy beasts, and many sheep, early in the summer. His pastures were thinly stocked with sheep only, during the rest of the year. The rot was extremely destructive in all the adjoining pastures, yet in his closes it never appeared. This exemption from the general calamity of his neighbours he attributed partly to his land being always well covered with grass, and partly to his grazing during that summer entirely with sheep. In wet weather, beasts and horses, by treading the ground, leave footmarks, where the water stagnates, and in consequence of it, as he believes, the rot is produced. In justice to the testimony of Mr. Elmhirst, it may be proper in me to add, that he has been an active and judicious cultivator of land, on a large scale, for a great number of years; every observation of his is, therefore, entitled to particular attention.

" I have remarked, that sheep are most liable to rot immediately after losing their fleeces; and in the month of November, when the cold first begins. No rot can be contracted without warmth, or in spring, before the sun's influence is become considerable; but, when the disposition is once acquired, it can only be subdued by frost, or a long succession of cold weather. Gabriel Plats assures us, with confidence, de-

rived from the experience of seventy-four years, that the only infectious months that beget the great rot are May and June, when excessive moistures befall those months. In a few instances, it has appeared in April, when showery weather and great heats have prevailed. In ordinary years, meadow may be irrigated till May, without any injury to the occupier. In doubtful cases, the generation of miasms will be effectually restrained, by continuing a copious and regular watering till the grass is well grown. The late Mr. Bakewell was of opinion, that after May-day he could communicate the rot at pleasure, by flooding, and afterwards stocking his closes, while they were drenched and saturated with moisture. In summer, rivers and brooks are often suddenly swollen by thunder storms, so as to pass over their banks, and cover the adjacent low lands. In this state no injury is sustained during the inundation; but when the water returns to its former channel, copious exhalations are produced from the swamps and low lands, which are exceedingly dangerous to the human constitution, and to several other animals as well as sheep. I formerly mentioned, that during the summer Mr. Harrison could give the rot to his sheep in a few minutes, by grazing them upon the moist soft land, from which the water of the Barlings had just retired. While there is any current, the sheep will never become tainted, although they often wade in search of their food.

"When miasmata are once formed, they preserve their noxious powers and destructive influence unimpaired, till the cold weather puts an end to their force and activity. In mild seasons, epidemic diseases have been known to afflict the human constitution, during the greatest part of winter; and the pastures which have once become unsound, are only to be recovered by the setting in of frost, or a succession of cold days and nights.

"The autumn and winter of 1799 and 1800 were remarkably mild and warm. At Candlemas time, sheep that were pasturing on the fen and commons at Walshinbrough, near Lincoln, took the rot, and died in the following autumn. No farmer in that parish recollected to have suffered, at any other time, from the rot in spring. Mr. Thompson, of Horncastle, informs me, that many years since, his brother occupied a low, wet close in the parish of Hatton, and lost all his sheep, before winter, of the rot. From that time the land remained unemployed till about

Candlemas. It was then filled with strong, healthy sheep: but they were all rotten, and many of them dead before the following May-day. He recollects, that there was very little frost during that winter, and consequently the effluvia were kept alive by the abundance of the herbage. Plats gives it for an infallible symptom, that when bees fail, and their hives feel light, a great rot of sheep is to be expected; which gives a very seasonable warning to bleed the sheep under the eye, or in the mouth, as oft as they see occasion, in the end of summer, or in autumn; or to accustom those which are suspected, to lick salt in troughs, or to take some brine with dry food, as they may be easily trained to it by gentle degrees; or to force down a dose of salt, as is directed.

"Where necessity requires the pasturage of moist grounds in summer or autumn, the shepherd ought carefully to remove his flock into a dry situation before the evening, and provide them with corn and good hay, or green food."

Upon the whole, from whatever cause the rot may proceed, it is evident, that the chief thing on which the farmer can depend is, that of changing the situation of the sheep to a dry spot, or of keeping them in warm and well-sheltered yards, and regularly giving them sweet, dry keep. If medicine be necessary, let a ball be given daily, for a fortnight, composed of five grains of muriated quicksilver, and one grain of opium, in camphor or turpentine; increasing the proportions, if the operation be deficient, and with slight intervals, if the balls operate too powerfully. When the sheep begin to recover, salt should be constantly given them with dry food; and, when they are turned out, they should be driven to a dry, salubrious, and elevated sheep-walk, or into a salt-marsh, if there be one in the vicinity.

The *Rubbers*, or *Rubs*, is a species of itch, which renders sheep extremely restless, and in consequence of which they rub themselves to death, being completely, but gradually, exhausted, from not being able to feed. Their skins are perfectly clean; and, when dead, their flesh becomes of a greenish hue, without possessing any bad taste. Those animals which are fed on fine, rich soils, are more liable to the rubbers than those which are pastured on poor lands; and the disease usually terminates, in the course of three or four months. No effectual remedy has been hitherto discovered; though it is probable

that relief might be obtained by washing the diseased sheep with strong soapsuds or ley, or by recurring to the remedies employed for the scab.

Scab.—This disease is likewise known by the name of *shab*, or *ray*, and is attended with an intense itching, and cutaneous, scabby irruptions, occasioned by the impure state of the blood. It prevails chiefly in wet situations, and during rainy seasons; and as the scab is said to be infectious, the diseased animals ought, in every case, to be separated from the rest of the flock.

The scabbed sheep should next be washed with a strong decoction of tobacco in brine, (in the proportion of one pound to two gallons,) to which a little oil of turpentine has been added; or, in inveterate cases, with a lather of black soap, lime water, or sublimate water, and oil of turpentine; sulphur and bay salt, or Glauber's salt, being administered internally. The following preparation has also been found effectual:—

> Mix one pound of tobacco, one ounce of white arsenic, one pint of oil of turpentine, and six quarts of beef brine, with a small quantity of tar, and boil the whole till the ingredients become incorporated so as to form a liniment.

In applying which, every scab must be *broken*, and the sheep be well rubbed, that the liquid may penetrate every part. Another efficacious remedy was communicated by Sir Joseph Banks to the "Society for the Encouragement of Arts, Manufactures, and Commerce", in 1789, from whose Transactions for that year we have selected it.

> Let one pound of pure quicksilver, Venice turpentine, and common oil, of each half a pound, and four pounds of hog's lard, be triturated in a mortar till the quicksilver is thoroughly incorporated with the various ingredients.

In applying this ointment, the head of the sheep must be first rubbed; after which a furrow is to be drawn with the finger, from the region between the ears, along the back to the point of the tail, so as to divide the wool, till the skin be exposed to the touch. Then the finger being dipped into the unguent, must be drawn along the skin; and similar furrows should be made down the shoulders and thighs, as far as the wool extends; and if the sheep be much infected, two other lines, or furrows, ought to be drawn parallel to that on the back; and one should also be traced downwards on each side, between the fore and hind legs. After this application, it is stated, that

the sheep may be turned out among the flock without fear of communicating infection, as the blotches will in a few days dry up, the intolerable itching will subside, and the animals will be perfectly cured without any injurious effects resulting from the use of such unction. But this external remedy should, in the opinion of Sir Joseph Banks, be not delayed longer than Michaelmas.

But, says Mr. Hogg*, the most effectual cure is that which can now be got in any apothecary's shop, known by the name of *sheep ointment*. It is a strong mercurial composition: and the most safe way is, for the apothecary to put it up in small balls, each of which he may deem sufficient, and safe to be rubbed upon a sheep at once; for as different hands may make it of different strength, the most experienced applier can hardly be a competent judge how much is sufficient for each animal, without some such precaution. Let the shepherd, then, take one of these balls at a time, and mix it with three gills, or a mutchkin of train oil, and if the animal be thoroughly infected, put the whole of this upon it, as close to the skin as possible; but if it is only scabbed or itching on some parts of its body, perhaps each of these mixtures may serve two. If the infected parts are mostly on the back, or upper parts of its body, the shepherd must make a shed, or opening of the wool, exactly on the very ridge of the back, from the crown to the tail: let him shed it clean to the skin, and keep it open with both hands, while another pours in the ointment from a common tea-pot. He must not keep the wool too close down with his hands, else it will cause the ointment to drip upon it. In this case, a few sheds, or openings, will do; but if it is scabbed about the belly and throat, it must be shed very thick, and the ointment rubbed on the skin with the fingers, as it cannot then spread in the skin by running. Let it always be done in dry weather; and it is a safe and certain remedy, though perhaps the scab may again appear on the offspring of this flock.

The *Tick* is a small, brownish, and flat insect, infesting sheep, and which, if not speedily destroyed, materially injures both the flesh and wool into which it insinuates itself. When the vermin have settled, scabs are formed on the surface, whence a small quantity of matter issues: as the insects increase in growth, the scab becomes proportionably larger, and at its full

* Shepherd's Guide, p. 96.

size nearly resembles a middling-sized horse-bean. In order to remove these noxious vermin, (which spread very rapidly,) it has been recommended to separate the wool, and to wash the diseased spots two or three times, or oftener, if necessary, with either of the following liquid preparations:—

One ounce of cream of tartar, and a quarter of a pound of bay salt (both finely powdered and sifted), and one ounce of corrosive sublimate, mixed together in two quarts of soft water.

Or,

Four pounds of soft soap, and two pounds of arsenic may be steeped in thirty gallons of water, and the animals be immersed in the infusion, their heads being carefully kept above water, and the sheep being sheltered from rain for one or two days. The wool must be closely pressed, and the liquor that runs off should be caught in a tub, or other vessel, for future use.

Of the latter application it is sufficient to state, that it has been approved of and used by many eminent agriculturists: the proportion above specified is sufficient to bathe forty lambs. The preparation by Mr. Priest of Norwich, already mentioned, may also be beneficially employed in this disease.

Affections of the Udders of Ewes.—After the lambs are yeaned, the lacteal ducts of ewes' udders are liable to various obstructions, in consequence of hard tumours being formed, which are accompanied with inflammation; and which, if not shortly relieved, will terminate in a mortification in twenty-four hours. As soon as such tumours are discovered, the wool must be shorn closely off, and the part affected be frequently rubbed with camphorated spirit of wine. Should suppuration ensue, the parts must be opened with a sharp knife, or razor, and the morbid matter expressed, when a little fresh butter, or any common healing salve, may be applied to the wound. Ewes, when thus affected, ought to be kept separate from the flock; and, though one teat may probably be lost, yet she may be allowed to suckle her lamb; but when both teats are affected, there is no alternative but to fatten her off for sale, and to bring up the lamb by hand.

White Scour.—This disorder is a peculiarly violent and uncommon looseness, occasioned by sheep feeding on putrescent vegetables, especially the shells of turnips, when suffered to lie on the ground after the flesh or pulp has been scooped out. The diseased sheep must be separated from the flock, and three large spoonsful of the following mixture be given them,

every second or third day, as the nature of the case may require:—

> Mix half a pound of finely-powdered and sifted dry bay salt with one pint of old verjuice, and then add half a pint of common gin.

As poverty of keep is the primary cause of this malady, the animals must be allowed the best and most wholesome dry food, and should be carefully kept from wet.

Wounds. — Besides the various casualties above specified, sheep are liable to receive injuries from being wounded by thorns, &c. or worried, torn, or bitten by mischievous dogs, or such as are not thoroughly broken in. Although such accidents may be in general prevented by due care and attention, yet in cases of common green wounds it may be necessary to apply some healing or emollient balsam or salve like the following:—

> Let one ounce of myrrh, a similar quantity of Socotrine aloes, and four ounces of purified turpentine, be mixed with a quart of good brandy. The vessel should be corked up, and exposed for one or two weeks to a moderate heat, after which it may be strained off, and preserved for future use in a closely-stopped bottle.

Lastly, the shepherd ought frequently to examine his flock, and see that their tails and buttocks be kept perfectly clean, otherwise they will become *tagged*, or belted, i. e. the skin will become excoriated and sore from the dung that adheres to those parts, especially when the animals are affected with the flux, or white scour. Where this is the case, the sheep must be taken into a dry, separate yard, and well washed with soap-suds, the wool around the sores being previously removed; after which the wounded parts may be strewed with finely-pulverized white lead or chalk, and this may be succeeded by rubbing them with a mixture of brandy and tar: but cleanliness alone will be quite sufficient to effect a cure.

CHAPTER VI.

ON THE DISEASES OF LAMBS.

It sometimes happens that lambs, when yeaned, are apparently lifeless, in which case it will be proper to blow into the mouth

and nostrils;—a simple expedient, which has been the means of restoring multitudes of these useful animals.

The *Black-water* is one of the most fatal maladies to which lambs are subject; the cause is not precisely ascertained, but the disease carries them off very suddenly, and occurs chiefly in the autumnal quarter. The best preventive hitherto known is, to keep them on very dry pastures.

The *Blood*, or *Red-water*, likewise often proves a mortal distemper to lambs. Its symptoms are, lameness and a slight swelling of the joints, accompanied with a violent inflammation that spreads over the whole animal; and which, if disregarded, terminates its existence in the course of twenty-four hours. This disorder is produced by too great a quantity of food remaining in the stomach, in a crude and undigested state. As soon, therefore, as the disease appears, the lambs must be taken home from grass, be bled, and an emollient clyster administered. Two or three ounces of castor oil, or as many grains of emetic tartar, should next be given, and the bleeding repeated, if no favourable symptoms appear; the treatment above specified being continued for four, five, or six days, as the case may require; and, during that term, the lamb should be fed with milk.

The *skit* is a kind of scour, or diarrhœa, and is sometimes divided into *green* and *white*, according to the appearance of the dung. Give a decoction of hartshorn-shavings and finely scraped chalk, in which a few grains of opium have been dissolved, and keep them on dry, wholesome food, in a well sheltered yard.

CHAPTER VII.

ON THE DISEASES INCIDENT TO SWINE.

In the management of swine, various hints have already been given for the regular supplying them with food, and a due regard to cleanliness; these attentions cannot be too forcibly impressed, as, on account of the unruly habits of these animals, they are the worst patients with which a farmer can be tormented.

Gargut.—This is an inflammatory affection of the udder, or bag, being distended with coagulated milk, whence the lacteal ducts are obstructed. It is chiefly occasioned by not *sucking down* in proper time; though too rich keep, before the time of farrowing, will also produce this malady. In slight cases, the udders may be bathed with camphorated spirit of wine; but as young pigs will never suck their dams when the milk becomes vitiated, there is no alternative but gently to express the corrupted milk, if it can be effected; otherwise it will be best to kill the sow, which must necessarily perish from the inattention above noticed.

Fever, or *Rising of the Lights*, as it is likewise called, appears to originate from over-feeding; it may be removed by administering a mixture of sulphur and oil.

Diseases of the Lungs.—These are generally accompanied with a dry, husky cough, and wasting of the flesh, occasioned by too great exposure to cold and wet. The best remedy is a warm, dry sty, with a regular supply of food that is calculated to keep them cool, and allay the irritation attendant on their cough.

The *Mange*, like the scab in sheep, is a cutaneous eruption, occasioned by inattention to cleanlines in hog-sties. It is easily known by the violent rubbing of swine against trees, or any hard substance, with such violence as to tear away the head of the pustule, and to produce a disagreeable scab. When this disease appears, the animal affected must be separated from the rest of the herd, washed thoroughly with a strong soap-ley, and anointed with the following unguent, recommended by Dr. Norford *.

> Incorporate one ounce of fine flour of sulphur, two drachms of fresh-pulverized white hellebore, three ounces of hog's lard, and half an ounce of the water of kali (as prepared in the shops), so as to form an ointment.

This is to be rubbed in at one time, and is said to be sufficient for a beast of six or seven stone: if properly applied, Dr. N. states that no repetition will be necessary, if the hog be kept *perfectly clean* after the cure is performed. In case there is a slight cough, he directs from half an ounce to one ounce and a half of crude antimony, according to the size of each animal, to be finely pulverized and mixed with his daily food, for ten

* Annals of Agric. Vol. XV.

days or a fortnight, when the swine will be perfectly restored. But if, from long neglect, the neck, ears, (especially in the large, lop-eared hogs,) or other parts become ulcerated, they should be anointed every third or fourth day with a little tar ointment, prepared by mixing equal parts of mutton suet and tar over a gentle fire, and straining such mixture while hot.

The *Measles* exist chiefly in the throat, which is internally filled with small pustules, or tumours, that sometimes appear on the outward surface of the neck. It is known by the languor and decline in flesh of the animal affected, and may be removed by giving small quantities of levigated crude antimony in his food.

The *Murrain*, or *leprosy*, in swine, is indicated by shortness and heat of breath, heads hanging down, staggering, and a secretion of viscid matter from the eyes. The cause arises chiefly from hot seasons, in consequence of which the blood becomes inflamed. Remedy:—

> Boil a handful of nettles in a gallon of small beer, then add half a pound of flour of sulphur, a quarter of a pound of pulverized aniseeds, three ounces of liquorice, and a quarter of a pound of elecampane.

Give this liquid in milk, at six doses; and keep the diseased animals on wholesome food. But the best preventive is to keep swine clean and cool in summer, and to allow no carrion, or filth whatever, to remain near their sties.

BOOK THE SEVENTH.

ON FARM OFFICES AND IMPLEMENTS OF HUSBANDRY.

CHAPTER I.

OF THE FARM-HOUSE.

ACCORDING to the manner in which husbandmen usually acquire possession of farms, it rarely happens that they have it in their power to erect a *farm-house* in such a situation, and with such offices, as convenience and other circumstances may require. Where, however, a farmer has, either by descent or purchase, a farm at command, or the old house is so much decayed that a new dwelling is preferable to making any repairs, it will be highly necessary, first, to consider the expense of the improvements proposed; this, indeed, is various in proportion to the value or rental of the farm, and may be computed to require a sum equal at least to from two to three years rent, or even more. In cases where the annual rent is from 300*l.* to 400*l.*, it has been estimated that one year's rent will, upon an average, be nearly sufficient for a dwelling-house; and in farms of greater extent, 500*l.* or 600*l.* are allowed for this purpose; and 1,000*l.* or 1,200*l.* for the requisite offices; but these calculations are of a general nature, and of course must necessarily vary according to existing circumstances. The inquisitive reader will meet with numerous useful estimates of farm-building, in the first volume of Communications to the Board of Agriculture; but, probably, an addition of 30 per cent. at least should be made to the estimates, for the difference of circumstances between the year 1808 (when they were first written) and the present time.

The other objects necessary to be attended to in erecting farm-houses are, a *salubrious situation* and *convenience;* points of infinite importance, as they materially affect the health and welfare of every individual.

Independently of the general salubrity of the place where farm-houses are proposed to be built, the nature of the *air* and *water* requires particular notice; the former should be pure and temperate, the latter wholesome and easily obtained. The most healthy spot, therefore, ought to be selected for building the house; which, where choice of situation can be commanded, should be as nearly in THE CENTRE OF THE FARM as circumstances will allow, and be exposed neither to the summer heats, nor to the rage of the winds and storms that prevail during winter. Many parts of our fertile island abound with rivulets and streams, which however are rarely regarded, though attention to this point is of the greatest importance. Hence a gentle elevation will be found greatly to conduce to the advantage of the farm-house, as well as to convenience of carriage; and where a quick-flowing stream has a clean channel and dry banks, it will add considerably to the beauty and salubrity of the place. An elevated situation, indeed, is not only healthier for the farmer, his family, and servants; but the manure from the farm-yard so situated, will all be conveyed to the fields in the cheapest and most expeditious manner; and, what is of more importance yet, the farmer, whose eye ought to pervade every place and every thing, if possible, will thus be enabled to superintend, with greater ease, what is going on all around him.

With respect to the situation of the house, as it regards proximity to the various offices, it has been laid down as a general rule, uniformly to select the three most exposed sides of a square for these, while the southern aspect is left open to admit the sun and air. Where, however, a farm-house is unavoidably to be built in the vicinity of marshes, it will be advisable to choose a northern aspect; for the north winds blowing more briskly than those from the south, the air is in general cool, putrefaction is checked, fewer noxious vapours will arise, and these will be speedily dispersed by reason of the greater density of the air.

Further, where convenience and other circumstances will admit, it will be best to erect the house at a moderate distance from the respective offices, and so to arrange the rooms commonly occupied for sitting, or working, as to command a view of

the business carrying on both in the house and abroad. Both the house and offices should be on a size and scale adapted to the produce of the farm; and attention to the following circumstances is essential in planning the house.

The kitchen ought not to be a thoroughfare, nor should any house-door open directly into it. The scullery ought to be as near it as possible, but without opening into it.

The mistress's store-room should have a square opening into the kitchen (with a sliding door,) on a level with the dresser or broad shelf that surrounds the store-room, through which she may give out whatever is wanted, to prevent the necessity of frequently passing by a circuitous way.

The common *keeping* or *sitting-room*, ought to open on one side into the store-room, and on the other into a passage leading directly to the cellar, which should be at a small distance, in order that the eye may attend what the hand need not perform.

The window of the *keeping-room* should look full upon the avenue to the yards, cattle, &c., and, if possible, full into the farm-yard.

The farmer should have a separate store-room for sacks, small tools, nails, &c.

With regard to the arrangement of the upper apartments, much will depend upon the fancy or wishes of the builder; let it, therefore, suffice to state, that the farmer's bed-chamber should have a window fronting the farm-yard; and every attention ought to be paid to keep the servants' apartments well ventilated, as a considerable portion of unwholesome air must be evolved from numerous persons sleeping in the same chamber, a circumstance that cannot be avoided in farms of considerable extent. The party-walls should be raised above the roofs of the offices, *to prevent the communication of fire*, especially where the farm-offices are *thatched*.

Before we proceed to discuss the various offices essential to a grass or dairy farm, it will be proper to annex a few hints on the time best calculated for building, as well as on the most useful way of covering the roofs of farm-houses.

For the first of these purposes, the month of April is preferable, especially where masonry work is requisite; for there is no point in building more necessary to be attended to, than

that of finishing at as early a period of the summer as possible, in order that the mortar may have sufficient time to dry before the approach of winter. An exception, however, may be made with regard to the farm-yard and offices, which, where repairs are wanted, cannot be done too soon, as they rank among profitable improvements.

The roofs of farm-houses are frequently thatched with straw; instead, however, of adopting this mode, it would be greatly desirable that they should be uniformly covered with slate, or tiles, in all situations where these articles can be procured. But where neither slate nor tiles can be obtained, heath or ling, as it is sometimes called, is preferable both for farm-houses and for out-houses. This vegetable, when well laid on by a judicious thatcher, is superior to straw; and at the same time so cheap, that in any place situated in the vicinity of heaths, or wild commons, it may be had for the mere labour of carting it to the premises.

A good well-calculated *kitchen-garden* is an important appendage to a farm, as it contributes greatly to diminish the expense of house-keeping; at the same time that it enables the farmer to try experiments with new plants, on a small scale, and at comparatively little risk. The kitchen-garden ought to be situated either on the back or side of the house, so that manure may be conveniently carried thither, and a proper regard should be paid to proportion the paths, or walks, to the size of the ground, as much soil will otherwise be wasted, which might be more beneficially employed. It would far exceed the limits of this work, to enter more into the detail of a kitchen-garden, the arrangement and culture of which must, in all cases, be regulated by the wants or caprice of the owner or occupier; let it therefore suffice to say, that particular care should be taken to *fence* it securely, so that neither swine nor poultry can enter, or injure its productions; and that its corners be *round* instead of square, which will facilitate the turning round of carts, and thus prevent damage both to them and to cattle.

CHAPTER II.

OF THE FARM-YARD.

No subject of rural economy, is of greater importance than the judicious disposition of the offices or out-buildings necessary to the successful management of a farm; yet there is, perhaps, less consideration bestowed on this point than on any other. It is obvious, however, to the most common observer, that the size of the various out-houses ought to be regulated by the extent of the farm to which they belong, and also by that branch of husbandry which is more particularly carried on. In a grazing or dairy farm, indeed, there are fewer offices requisite than in any other department of agriculture; but it is, nevertheless, highly necessary to have distinct buildings for the various sorts of cattle; and the whole of these should be so distributed, as to facilitate the labour and convenience of the servants. Further to promote this object, the whole of the buildings should, if possible, be placed within the same inclosure; or if in more than one, they should be immediately adjoining, for when distant from each other, much time is unavoidably wasted through the want of ready communication. The yard in which they are situated should also be secured against all outward access: if the buildings are not so connected as to form a complete inclosure, the spaces between them should be filled up with wall, or high paling, and the yard should be closed by solid gates. Where chalk can be commanded, the surface or bottom of the yard should be bedded or coated with it, or with some other material impenetrable to water; by which means the filtration of urine, or moisture, in the smallest degree, will be effectually prevented, and consequently a great saving obtained in the article of animal manure. The construction of the yard should be nearly convex, or shelving to the centre, in order to collect the drainage from the stables and cattle sheds, and it should have a pipe or drain communicating with a cess-pool, or at all events with a dung-mixen outside. In order to avoid this expense, which is, in fact, very trifling, most farmers bottom the yards with earth, or

rubbish, to absorb the drainage, and thus form a compost in the yard itself. This saving, however, even were it larger, can be of no importance in comparison with the injury done to the store cattle by thus retaining the moisture underneath them, for dryness of situation is of the most essential consequence to their health, and indispensable to their thriving. The driest bottoming is furze; but stubble, potatoe haulm, or any other loose refuse, will answer the purpose; over which the yard should be bedded deep in straw: earth, though most valuable in a compost, should never be used within the yard. Of the principal offices requisite to a farm, we now proceed to give an outline.

1. *Ox-Stalls*, or *Feeding-Houses*.—The structure of these buildings is very simple: it is, however, requisite, that each interval, or stall, should not only be provided with a crib, for dry food, but there should also be, in the centre of each, a vessel, or trough, for the reception of water, which may be conducted into them by means of tubes leading from the pump, if this be contiguous; and through which it may be poured from buckets, &c. where that convenience does not exist. The *size* must depend upon the manner in which the farm is occupied: but it ought never to be forgotten, that the beasts should have *ample accommodation*.

In order to erect feeding-houses, or ox-stalls, to advantage, great attention should be bestowed on their situation, which ought to lie dry, and not be exposed too much to the sun, or to the heat of the weather. It will be advisable to lay the floors in a *gently sloping* direction, with proper drains for carrying off the urine, and also for the more easy removal of dung and other filth. The floors are variously paved: by some it has been recommended to have the pavement of stone pitched; but the least expensive method is, to lay the floor with Dutch bricks, or *clinkers*, as they are sometimes called, and which are usually employed for flooring or paving stables. The doors also should be so hung as to open outward, by which means a waste of room will be prevented, and the sheds will be rendered more secure against intruders. Their safety will also be greatly increased by hanging them with a fall to the catch; and, to prevent them from receiving any injury by the weather, when open, they should also have a fall backward, under the eaves of the building. This desirable object may be effected by placing the

balance-point in the midway between the two extreme positions of the door, which being set at a right angle to the line of the building, has a fall to either hand*.

The *width* of stalls is various: for two middle-sized Devonshire working oxen, Mr. Marshall conceives *seven* feet to be sufficient, and *nine* feet for those of a larger size. Cows, though in general smaller than oxen, require equal, if not more room for the conveniency of milking them as well as of suckling their calves. Much caution is necessary in constructing stalls, that they be not made too wide, lest the cattle turn round in them; and thus the stronger beasts will have an opportunity of injuring their weaker fellows. But this danger may be avoided by placing a post in the middle of the stall, immediately before the shoulders of the cattle, in a line with the front posts of the *partial partitions* †; in which place a post may be found useful, to fasten calves to while sucking.

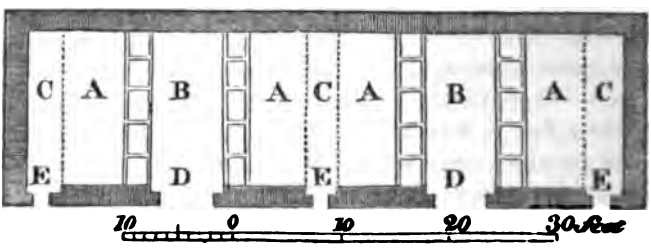
The health of cattle being a circumstance of the greatest importance, especially where the system of stall-feeding is adopted on a large scale, it will be necessary that there be a regular temperature maintained, as the confined respiration of many animals must necessarily tend to generate diseases. Hence, though a loft may be built over the stalls for the reception of provender, &c. it will be advisable to construct latticed windows, or apertures, at a considerable distance from the ground, at the gable ends of the feeding-houses, and to supply them with shutters, which may be closed or withdrawn as the season of the year, or the temperature of the weather, may render this necessary. Where it is practicable, such openings should be towards the north or east, in order that they may derive some benefit from the genial rays of the morning sun, and from the cooler air of the day in summer; beside which, the large front doors may sometimes be set open for the purpose of further ventilation, whenever that may be deemed advisable.

Notwithstanding the obvious utility of free ventilation in feeding-houses, there are not wanting instances of persons who recommend a contrary practice; and, singular as it may seem, assert that the tendency of animals to become fat is materially promoted by *sweating* them. We have already mentioned that

* Marshall's Rural Economy of the West of England, Vol. II. p. 319.
† Midland Economy, Vol. I. p. 33.

this mode of treating cattle has been tried on an extensive scale, by Mr. Moody, of Retford, who avers, that the hotter cattle are kept, the better they will fatten. He, therefore, shuts them up in a feeding-house, into which no air is allowed to enter for some time. In consequence of the heated breath of so many beasts, a most profuse perspiration is produced; and when this is at its highest point, they fatten most speedily. After thus sweating for about a fortnight, the pile or hair falls off, and is replaced by a fresh coat, after which the animals sweat no more; those cattle, however, which do not sensibly perspire, seldom grow fat.

As in every building convenience is a primary object of consideration, so in farm-offices in particular this point demands minute attention. In addition to the *byre*, *hammel*, or *mistle*, as cow and ox-houses are variously termed, the following plan of a similar building, much used in the county of Roxburgh, in North Britain, may not improperly be annexed *.



The feeding-house here delineated is sixty feet in length, by eighteen in width, and is capable of containing twenty cattle standing across the house, with their hinder parts towards each other; while a sufficient interval is left between them for storing up turnips or other winter food. AAAA represent four spaces for the cattle, five being allotted to each, and which may be fitted up either with cribs or with stone troughs. BB designate two spaces for receiving roots, each interval being eight feet wide; they are separated from the troughs, or cribs, by means of strong wooden partitions (for which a thin party-wall is sometimes substituted,) from three to three feet and a

* See Sir J. Sinclair's Husbandry of Scotland, Vol. I. pp. 25, 26, and Vol. II., Appendix, p. 192.

half in height. DD, the doors, are sufficiently wide to admit a cart to be backed in, and turned up; over this low partition the turnips, or other *roots*, are thrown to the beasts. CCC are passages four feet in breadth, behind the animals, for the purpose of removing dung and filth by means of the doors, which are respectively marked EEE. Should a particular situation require, or render it convenient, the large door just noticed may be disposed in the back of the feeding-byre, or ox-house.

Although the plan above delineated is calculated for twenty beasts, it may be adopted with equal ease, where ten, or even a smaller number, are kept; for, on supposition that five feeding-cattle are placed on one side, and a similar number of young beasts, or milch kine, are arranged on the opposite side, the green tops of turnips may be thrown on one side to the young animals, while the roots are cast on the opposite side to those which are fattening.

Beside the regular feeding-houses, the plan and construction of which have been thus briefly detailed, it will be greatly conducive to the grazier's interest, to have the roofs of these buildings project forward, on the back front, to such a length, (such roofing being supported, at the extremities, by strong wooden posts, or pillars,) as to afford open sheds for the use of store cattle, into which they can withdraw from the straw-yard and obtain shelter in bad weather. They should be well littered, and the beasts may be respectively separated in the same manner as in cow-houses, a similar interval being allowed for each, and the floor being also laid on a gentle descent, not only for the convenient removal of urine and excrement, but also for the ease and comfort of the cattle.

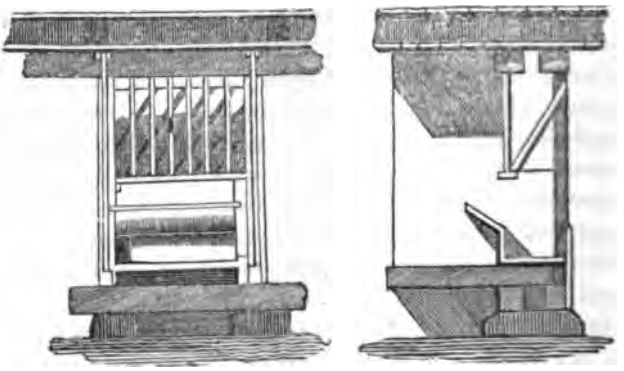
2. In constructing *stables*, as in feeding-houses, the principal object is the situation, which should, therefore, be on an airy, healthy spot, not exposed to putrid or noisome exhalations, and on dry, hard ground. The walls ought to be of a moderate thickness, and supplied with casements on the eastern and northern sides, not only for the admission of air, but also to receive the benefit of the rising sun. Shutters should, at the same time, be furnished for the purpose of excluding the light, if necessary, during the day-time. The door should be as near as convenient to the entrance of the farm-yard, or if consistent with security, outside of it, in order that the horses may not have to pass through the store cattle in the yard.

Few objects are less attended to in building stables, than the arrangement and formation of the mangers and racks. These, according to the common practice, are needlessly extended across the upper end of the stall; thus much provender, by being drawn and trodden under foot, is consequently wasted.

This inconvenience is not peculiar to the stables of Britain; it equally prevails in America, where two spirited farmers, of Philadelphia county, have contrived stalls that not only prevent the unnecessary consumption of food, but also contribute wholly to preserve horses from the dangerous consequences arising from hay-seeds falling into their eyes and ears.

The first of these which claim our attention, are the racks of Mr. William West's stalls: they are upright, and the perpendicular falls on the inner edge of the trough below, which has a shelving leaf, as delineated in the annexed figures; A representing the elevation of the stall, while a transverse section of the same is delineated at B.

A B



When a beast pulls out the hay, some will fall on the leaf, and thus slide down into the trough, where it is secured from the breath of the animal. The distance between the bottom of the rack and the trough is sufficient to permit the animals' heads to enter, in order that they may get at the dropped hay. The racks are two feet four inches deep, and two feet at the top, from the edge of the rack; they are planed within, so that the hay falls to the bottom of the rack, in proportion

as it diminishes in quantity, and the cattle are saved the pain of a long reach, which they are obliged to make in the stables built after the common way. It should be observed, that Mr. West feeds from the entry, which is six feet in width; and that the hay is dropped through a trap-door from the store above.

Equally useful and economical, in the article of food, are the racks of Mr. J. Cooper's stalls, the construction of which the following delineations will explain.

Fig. 1. Fig. 2.

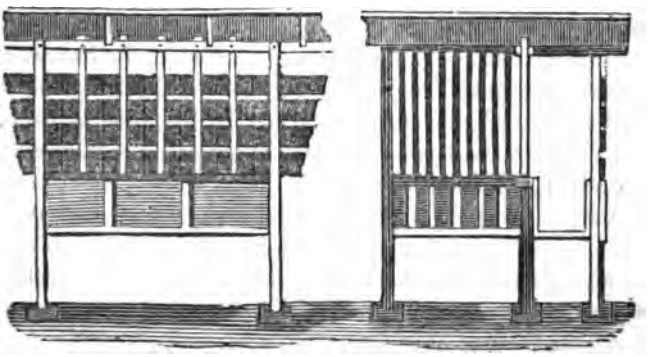


Figure 1 is an elevation, and figure 2 represents a transverse section of Mr. C.'s stall. The benefit to be derived from it is very great, as the upright *slats* prevent the horses from wasting the hay, as well as from blowing on it. By this contrivance the animals are prevented from looking round, a habit to which horses are much accustomed when any person enters the stable; neither can they thrust their heads over the whole trough, as the *slats* compel them to feed directly before them.

With respect to the *paving* of stables, it has been considered advisable to cover the part on which the horses are to lie down with *oak boards*, disposed transversely upon a level; and these ought to be pierced with numerous holes, for conducting the urine from the *stall-drain* into the common or main drain: the other part being paved with small stones, sloping about an inch and a half, or two inches, towards the perforated boards; and the adjacent wall ought to be lined with a wainscot of sound and well-seasoned oak. But these boarded stalls are apt to retain the damp, and a clinker pavement is far superior.

Cart-horses are generally put into a loose stable, without any divisions between them. There is economy of room in this, but it is attended with frequent accidents in consequence of vicious animals kicking each other; and the strongest, also, generally get the largest proportion of provender. Horses also feed too eagerly, when tied up together, for the due mastication of their food; and the expense of stalling their stables will be overpaid by the advantages of security and quiet feeding.

The *width* of the stalls should be five feet and a half at the least, to enable them to lie down, or turn round without inconvenience; at the same time it will be requisite to elevate the divisions near the head, so that strange horses can neither smell, see, nor molest each other. Throughout the whole course of the stable-management the utmost cleanliness must be rigorously attended to, in order to preserve these useful animals in perfect health; hence the farmer will find it greatly conducive to the ease and regularity of this branch of economy, to appropriate some part of the loft, or room above, for the reception of corn; the distribution of which may be greatly facilitated by means of a hopper, or tube, communicating with the manger by means of an aperture; and also to provide a convenient part of the stable for keeping the necessary *gear*, or harness.

Lastly, as the efforts of the industrious farmer to preserve his stalls in a proper state of cleanliness are sometimes frustrated by vicious animals discharging their stale and excrements into the manger, we shall conclude this article with a concise account of an expedient for fastening cattle in stalls successfully employed by Mr. Morgan, an enlightened agriculturist of the Western Hemisphere. For this purpose, his stalls have a fixed iron-chain, by way of a halter, which is fastened to a *standard*, mortised into the front side of the manger, and the joist above. It is composed of two parts: one of these has sixteen links, and is two feet in length, measuring from the staple; the other, which contains twenty-six links, measures about thirty-nine inches, and serves as a collar. At one end of this *collar-chain* there is a ring, about one inch in diameter, and at the opposite extremity a key, three or four inches in length, having a hole at its middle, by which it is joined to, and freely plays in the last link. The first chain, which by one end is fixed to the manger, is by the other linked into a middle link of the collar-chain, and thus

forms two arms, which, being thrown round the neck of the beast, and the key being thrust through the ring, and placed at a bar across it, makes a very secure fastening.

3. In those farms where corn-husbandry is chiefly practised, *barns* become essential articles; where, however, dairying, or cattle-grazing prevails, they are of less moment; and, perhaps, every advantage that can be derived from these buildings may be obtained by constructing a chamber-barn, or large chamber, with ventilators and a strong oak floor over stables. But in case it is necessary to erect new barns, care should be taken to make the floors dry and firm, for which purpose oaken planks are preferable to any other material. There should also be a sufficient number of apertures, through which hay and straw may be housed, and they should be placed immediately adjoining the rick-yard; thus many of the inconveniences will be avoided, which must otherwise result from drawing loaded vehicles into the barn.

The following plan of a barn, which is one of the most advantageous hitherto submitted to the inspection of agriculturists, was drawn up by Mr. Young, for the use of the late General Washington, who had requested him to furnish the draught of a barn, and the necessary out-buildings for a farm of 500 acres.

The inner width of the barn is twenty-seven feet square, on each side of the threshing-floor; the porch is eleven feet four inches by twelve feet three inches; the threshing-floor thirty-nine feet by twenty on its upper end, and twelve feet and a half at the small door of the porch, which is six feet and a half in width: the great door, at which the carts enter with grain, is fourteen feet nine inches; the sheds for cattle, on the longitudinal sides of the *bays*, are twenty-seven feet by twelve; the mangers are two feet broad, out of which the cattle eat their food; the passages for carrying straw from the threshing-floor to feed the cattle, are between two and three feet wide, each passage has a door; there are four principal posts to each shed, beside the smaller ones, and gutters for conveying the urine to four cisterns, whence it is every day thrown upon dunghills placed at a convenient distance; from the mangers to the gutters there is a sloping pavement of bricks, laid so as to terminate six inches perpendicular above the gutters; this pavement is six feet broad from that edge to the manger, and the gutters are from eighteen to twenty inches in breadth. At each of the

four corners of the threshing-floor there are four sheds for various uses, and at each end of the barn there are two yards with a shed, to be applied to any purpose wanted; one for sheep, surrounded with low racks, and the other divided for a horse or two, loose if necessary; the other half is for yearling calves, which thrive better in the farm-yard than when stalled. The yards just mentioned are enclosed by walling, or by pales. The main body of the barn rises fourteen, sixteen, or twenty feet, to the eaves. Against the walling are various sheds for the reception of cattle. If the number of cattle intended to be kept be greater than here admitted, a circular shed may be erected fronting the small door of the porch, and the hay-stacks be conveniently arranged near the sheds appropriated for cows, horses, or fat cattle*.

Where thrashing machines are not in use, the barn-floors should be invariably of oak; for the grain is apt to be bruised upon a stone or hard compost floor, and the straw does not yield so well under the flail.

4. The *Granary* should be adjacent to the barn, and may be constructed with great advantage in the roof of that building, immediately over the thrashing floor, by which means the corn may be hoisted up, when ready to be stored, and let down into a waggon drawn underneath when wanted for use, without the labour of carrying out: it is also more secure in that situation from depredation. The most usual mode, however, is to erect it upon pillars in the farm, or stack-yard, in which manner they are safest from the attacks of vermin. They should have latticed or wired windows, and be provided with bins for the separation of the different kinds of grain; as well as with conveniences for the storage of sacks, sieves, and measures; and above all, with good fastenings; for it is a melancholy fact that whether from increasing depravity, or distress, village honesty is so far from being any longer proverbial, that farm servants are now rarely to be found trustworthy.

When grain has been stored for any great length of time, particularly if in large quantities or in warm weather, it is much exposed to that destructive insect the weevil; it is also subject to heat, and to acquire a musty smell; the only preventive of which injuries is to keep it well aired, turned, and screened: for this purpose, besides constant ventilation, the floor of the

* Annals of Agriculture, Vol. XVI.

granary should be capacious, clean, and smooth. If carefully kept, the quality of corn improves with age; but it shrinks in bulk.

5. Among the smaller buildings incident to a farm, a *cart* and *tool-house* for the reception of the waggons and implements, when not actually employed, is not the least worthy of notice; (though it not unfrequently happens, that such instruments are heedlessly left on the spot where they are last used;) and, as these consist chiefly of wood-work, the building allotted for this purpose ought to be so contrived, as to afford a secure shelter from rain, while the implements are thoroughly exposed to the ventilation of air. Hence an open spot, free to every wind, should be selected: the roof ought to be supported on pillars, and the sides similar to those of drying-houses, in bleach-fields, with moveable boards for admitting air and excluding rain. An open space of about three feet, may be left towards the bottom, as at that depth the rain cannot penetrate so as to be productive of any injury. Previously, however, to depositing any implement in this place, it ought to be carefully cleaned and dried*. But as the only object is to preserve the carriages and tools from the effects of wet, this can be attained by mere sheds, the most economical mode of erecting which is, to project a roof from the back of a barn or stable; if possible, immediately fronting the road into the yard: they should never be constructed withinside the inclosure.

6. *Calf-Pens.*—In most parts of this country, it is the practice to appropriate a part of the cow, or feeding, house to the reception of calves; a measure which cannot fail of producing uneasiness among the cows, which often withhold their milk in consequence of the bleating of the young animals. Hence, unless for the purpose of suckling, it is obviously preferable to have the pens at such a distance from the feeding-house, that the cows cannot hear them.

The construction of these buildings is so simple, and so well known, that a particular description is deemed unnecessary. They should be latticed, so as to admit fresh air, as a moderate and rather cool temperature ought at all times to be kept in calf-pens; but light should be excluded, as darkness inclines all animals to rest, and the quieter calves are kept, the better they will thrive. The strictest cleanliness should also be observed, and every attention paid to keep them dry and sweet.

* Kaimes' "Gentleman Farmer," p. 56.

7. When the profit arising from the rearing of swine is duly considered, and there is an opportunity of carrying on this branch of rural economy to any extent, it will be admitted, that the establishment of a *Piggery* demands nearly as much attention as a dairy.

A piggery, in the opinion of Mr. A. Young, should be in a circle, or it must fail in convenience; according to his idea, in the centre there should be the boiling or steaming house, with a granary for corn, meal, &c. Around this a range of cisterns ought to be disposed, in divisions, for receiving immediately from the copper, or steam apparatus, and also by tubes from the granary. Around these should run a path, then a fence or paling, in which are the troughs, with hanging lids, for supplying food directly from the cisterns, on one side, and for hogs feeding on the other; a range of yard next, and another of cow sheds beyond, and last of all the receptacle for the dung. The potato stores, or *pyes*, should at one end point near to the entrance, and water must be raised to the coppers and cisterns at once by a pump; a trough, or other conveyance from the dairy to the cisterns, for milk, whey, &c. An arrangement like this, he conceives, would be very convenient, while the expense attending it would be inconsiderable; and great profit might be derived, by setting apart a plot of natural or artificial grasses, into which the swine might be turned at pleasure. "Those", he adds, "who do not possess a convenient pig apparatus, can have little idea of the great use of it in making manure. This alone becomes an object, that would justify any good farmer in going to a certain expense, for attaining so profitable a part of what ought to be his farm-yard system."*

By means of a yard constructed on this plan, Mr. Young fattened *eighty-eight* hogs in one spring, with the attendance of only one man; whereas three would have been inadequate to the task without such conveniences. The total expense of such a yard *now*, he thinks, would not be less than 150*l.*; and, if it were constructed according to the more correct idea, the cost would amount to 200*l.* or 250*l.*, but the *governing idea of position* should be followed in a *sty of* 20*l.*

This plan, however, is obviously calculated only for those

* The Earl of Egremont has an extensive range of sties, at Petworth constructed nearly upon Mr. Young's plan; an engraving of which, with the necessary explanations, may be found in the Agricultural Survey of Sussex.

farms where the fattening of swine is carried on upon an extensive scale. Where these animals are kept chiefly for domestic consumption, it will be sufficient if hog-sties be constructed with due regard to warmth and dryness, and divided into various partitions for the reception of swine, according to their age, varieties, &c. Each division should be between six and seven feet in width, of such a height as the largest pigs can conveniently enter, and with thatched or tiled shed roofs, as convenience or other circumstances may require. Each partition should be kept clean and well littered, and should be provided with a small space sufficiently capacious for holding the feeding-troughs, so that the swine may be conveniently fed without unnecessarily going in among them. The troughs may be so arranged, that offal, milk, &c. may be conveyed into them from the milk-house, or scalding-house, by means of pipes; and as these animals often thrust their feet into the troughs, and thus waste a considerable portion of food, this may be avoided by fixing sticks in a frame over the troughs, not unlike a rack; or a thin piece of plank may be nailed on the back part of the troughs, and so project as to allow their heads only to enter.

This object may also be attained when swine are put up to fatten on dry food, by fixing a conical hopper (holding any given quantity) in a trough, with the broad end upwards, and covered with a strong lid; at the lower end should be an aperture for giving out the meat into the trough, where the animal may eat it as it falls, without being capable of spoiling or wasting any portion of it. By adopting the expedient here suggested, the further advantage will be derived in fattening swine, that, by feeding more leisurely than in the common mode, their food will probably be more thoroughly masticated; the effect of which has been thought to render their fat more firm, and of a better flavour, while it will be less liable to become rusty, qualities which must evidently contribute to the profit and reputation of the breeder.

8. *Straw and Root Houses* are buildings the utility of which, on those farms where the stacking of hay and straw is not adopted, is very great; as much time is saved in carrying hay and straw to cattle, perhaps from a considerable distance, and often with much waste. Where, however, stacks are employed, it will be advisable to convert the hay or straw house into a store-room for *roots*, and to supply it with a *root-steamer*, for the

purpose of preparing such vegetables for the use of the cattle. This simple machine, in fact, is indispensably necessary on all farms where the feeding of cattle is conducted to any extent.

The apparatus here delineated consists of a brick or stone stove, about three feet in every direction, in which is fixed a pot or kettle, half a foot or eight inches deep, and eighteen or twenty inches in diameter. Over this boiler (when about half full of water) is placed a hogshead, or cask, the bottom of which is perforated with numerous holes, about an inch in diameter, so that the steam may freely pass through the roots. In America, whence this contrivance was introduced into England, the top of the cask is usually left open, which might more advantageously be covered with a thick coarse cloth; or, which is much better, after the vessel is filled with the washed roots, it is closely clayed all round, and the head fastened down to confine the steam; and, if necessary, a short wooden plug may be inserted for the purpose of admitting air, and which may be removed at pleasure. When sufficiently steamed, the roots may be removed by means of a shovel, or by turning the cask over; and, thus prepared, they afford a more invigorating food to cattle than if they are given in a raw state. In small farm-houses, however, the family copper may advantageously be employed, by suspending over it a tub, the bottom of which is perforated with holes, so as to be lowered or elevated by a rope or pulley fastened to the ceiling. The tub may be of such a size, as to admit of fourteen inches to go into the copper; and to prevent it from sinking deeper, the part may be confined by a large hoop*.

8. *Pounds* are of very frequent occurrence, for the reception of strayed or trespassing cattle; but they are capable of being applied to more useful purposes, and, in fact, constitute a very great convenience to a farm. It will be advisable to arrange them so as to serve four or five fields. In case of accidents to neat or other cattle, or when these are wanted for examination, pounds will be found very advantageous; as much loss of time

* Another simple steam apparatus is figured and described in Sir John Sinclair's Work, Vol. II. Appendix, p. 40—43.

is thus saved, which must otherwise be unavoidably incurred by driving them to the farm-yard.

Beside the various buildings above specified, it will also be proper to have stalls of similar construction with those already described, for the reception of sick or diseased cattle, which should be erected in some spot contiguous to the farm offices, but at such a distance as to prevent the healthy beasts from being affected by contagion.

CHAPTER III.

ON THE CONSTRUCTION OF PONDS.

THERE is no article of greater importance to the health of animal life than a constant supply of water, which, being the only liquid cattle are accustomed to drink, ought, therefore, to be perfectly pure. Good water is indicated by limpidity and clearness, by continuing transparent notwithstanding the application of alkalies or other chemical tests, and by passing easily through the intestines. But its relative salubrity necessarily depends on the peculiar properties it possesses, and on the various mineral substances through which it passes. Thus, spring water, and that obtained from wells, are most wholesome when they have undergone a perfect filtration through sandy soils; and as the fluid usually consumed in farms is derived chiefly from these means, we propose, in the present section, to state a few of the most approved modes of preserving, or disposing of it to advantage.

Wells are the most frequent contrivances occurring on farms, for supplying water: their structure, indeed, is not immediately connected with the nature of the present work; but the following method of obtaining water, in almost every situation, is so simple, that we cannot but think its insertion will be of some advantage, particularly in those districts which are not remarkable for an abundant supply of that necessary fluid. This

expedient was devised by M. Cadet de Vaux, an intelligent chemist of Paris, who directs the soil to be perforated with an auger, or borer; a cylindrical wooden pipe is then to be placed in the hole, and driven downward with a mallet, and the boring is to be continued, that the pipe may be forced down to a greater depth. As the borer becomes filled with earth, it should be drawn up and cleared; and, by adding fresh portions of pipe, the boring may be carried to a great extent under ground, so that water will thus, in most cases, be obtained. Wells made in this manner are superior to those constructed in the common mode, not only in point of cheapness, but also by affording a more certain and abundant supply, while no accident can happen to the workmen so employed. In case the water near the surface should not be of a good quality, the perforation may be continued to a greater depth, till a fluid of a purer kind can be obtained; and, where wells have already become tainted from any circumstance, or accident, if they be previously emptied, and the bottom perforated in a similar manner, so as to reach the lower sheet of water; this, being in the cylindrical tube, will rise in a purer state into the body of the pump fixed for this purpose*.

But, beside the convenience of having a supply of water at hand for domestic uses, as also for the consumption of the farm-yard, it is equally necessary to have, in the fields, one or more *drinking-ponds*, as the extent of the farm may require.

The situation best calculated for making ponds is at the bottom of a gentle declivity, (where that can be obtained,) and in the corners where two or more fields meet together; by which means a regular supply of water will not only be procured after rain has fallen, but also the cattle can be watered with less waste of time and of ground. Clayey soils are mostly selected for this purpose; but as these are liable to crack and become leaky from perforations by worms, and also from the evapora-

* In the Frontispiece is delineated an arrangement for distributing water in a farm-yard, invented by Mr. J. Cooper, an intelligent American farmer. His contrivance is excellent; for, by the disposition of his spouts and fences, he is enabled to water four different kinds of beasts at the same time, as is obvious on referring to the frontispiece.

tion of the water by intense heat, various expedients have been invented to prevent these inconveniences, and render ponds water-tight.

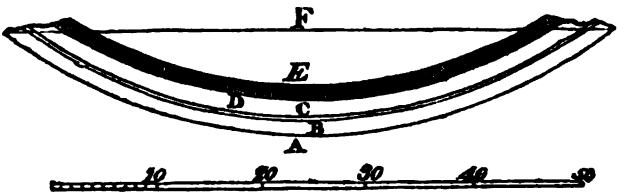
In making ponds, the pit ought first to be dug to a convenient depth: for those of 120 feet in circumference, or forty feet in diameter, five feet is a sufficient depth, which may be enlarged to seven, if the pond be 180 feet in circumference, or sixty feet in diameter; and if the situation will allow a reservoir to be constructed for the reception of the waste water, on the upper side of the main reservoirs, that portion of the water which is intended for the use of cattle will be preserved in a state of greater purity, while the sediment that will, from time to time, be collected in such reservoirs, may be easily drawn out thence, and converted into an excellent manure. Further, from these reservoirs an additional advantage might be derived, particularly if they lie in the vicinity of a town where there is a demand for *fish*, by stocking them with the last-mentioned animals, which would also afford an agreeable variety of food for domestic consumption. Lastly, the sides of the ponds should be carefully sloped to an angle of about forty or forty-five degrees, so as to admit the cattle with most convenience to them, and with little or no detriment to the bottom of the ponds.

Having thus stated a few preliminary circumstances necessary to be attended to in constructing ponds, we proceed to notice the most useful of the cements suggested for rendering them *perfectly retentive* of water, without requiring the aid of masonry-work.

While the cavity is digging, let a sufficient quantity of moist, brick clay be incorporated with one-fourth part of quicklime, (which should be slaked, the evening before it is used, with such a quantity of water as will make it of the consistence of cream cheese,) and the whole be formed into balls of two feet in diameter, or about six feet in circumference. After the pit is finished, and a proper supply of these balls is obtained, the labourer is to descend into the cavity, where a ball is thrown to him; this must be thrown on the ground with all his strength, as nearly into the centre as possible. Successive masses, or balls, are placed in such a manner, that every one comes in contact with that which follows it, until the bottom and sides are completely lined. In case the whole of this

operation cannot be finished in one day, it will be necessary to moisten the row last applied in the evening, in order that it may adhere to, and incorporate with such as remain to be laid on. Two or three days after this lining is completed, it must be beaten with a flat piece of wood, which labour should be continued with greater strength in proportion as the firmness increases; and the surface ought occasionally to be moistened, to prevent it from cracking, till the whole becomes a uniformly solid mass. A coating of any cheap oil is then to be applied, on which a stratum of gravel, (about one inch in thickness,) should be laid before the pond is filled with water. Thus the coating will become remarkably firm and solid, and require no repairs, provided the pond be kept constantly full; as those parts of the work only which are exposed to the air, are liable to be damaged by intense frost *; but this inconvenience, we think, may be avoided, if a scarcity of water be apprehended, by collecting and heaping large quantities of snow upon them, the first winter after the ponds are completed.

In the annexed engraving is delineated an outline of a pond for soils where there is a scarcity of water, of which description there are many in the county of York, where they were introduced about forty years since.



The line A represents a circular hole made in the ground, of such dimensions as circumstances may require; on this a stratum of clay, B, must be carefuly beaten and trodden till it become a solid, compact mass, from four to six inches in depth. The line C describes a layer of quick-lime, about an inch, or an inch and a half in thickness, which should be also uniformly spread over the whole. D is a second stratum, or bed of clay, which ought likewise to be from four to six inches in depth, and be beaten and trodden down in a similar manner. The letter E designates stones or gravel, either of which minerals

* Journal de Physique, Vol. I.

must be spread on the second bed of clay, to such a thickness as will prevent the pond from being *poached*, or injured by the feet of cattle, and consequently save the water from being discharged through the pores of the earth. F delineates the line of level both of the ground and of the water; and, when thus finished, the pond will be about five feet deep, and forty-five in diameter, the usual dimensions of these useful reservoirs in Yorkshire. The expense of constructing ponds, of the size above specified, is stated to be from four to six pounds sterling, according to the distance whence the clay is carted; and reservoirs thus formed will remain unimpaired for many years, as the lime prevents worms from striking either upwards or downwards, and of course from damaging the clay.

CHAPTER IV.

ON FARM-COTTAGES.

It is a peculiar feature of the improved Husbandry of Scotland, and amply deserving of imitation by the more opulent landholders of England, that, in all the best cultivated districts, separate cottages for the farm-servants are considered indispensable. In North Britain every hind, or married ploughman, has a separate house provided for him by his master, which the hind furnishes himself. The cost of these cottages varies from £30 to £50, according to size and the distance whence materials are brought. They are placed at a convenient distance from the farm-house, and have a kale-yard, or garden adjoining*. This plan has been recommended and adopted in various parts of England, with equal improvement in comfort and moral character to the labourers by whose families they are occupied; with the addition in some counties, of sufficient land to keep a cow, or pasturage for one, at a moderate rate with the farmer's

* Sinclair, Vol. I. p. 23, and Vol. II. p. 242—244, where a plan is given of a Scotish cottage on a small scale.

stock. This not only materially conduces to the comfort of the labourer's family, but it attaches him to his master; which is an object of more importance than it is generally considered. Families having such an advantage are rarely known to become burdensome to the poor's rate, and are generally remarked for their sobriety and superior industry. Farmers have an objection to granting them land for the support of a cow, from a notion that they pilfer to maintain her in winter; but that reason, if it really is founded, cannot apply to the allowance of pasturage with the farm stock.

CHAPTER V.

ON WHEEL CARRIAGES.

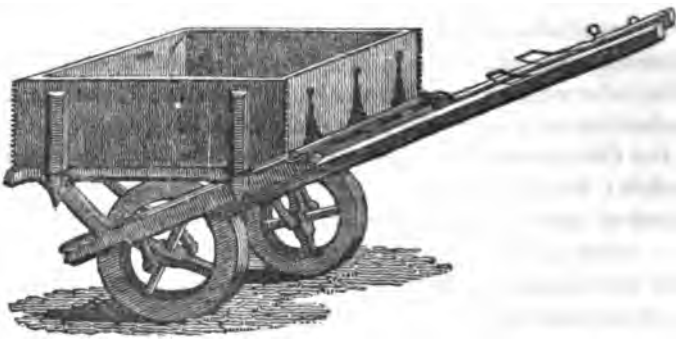
No department of practical mechanics has, perhaps, been more assiduously cultivated, of late years, than that which has for its object those implements which are used in the various branches of *husbandry;* but our observations being confined to the management of grass-land and feeding, which require but little machinery, the subject only demands brief notice. It would far exceed the limits of the present work to notice the waggons of every district, or county, especially as the indifferent principles on which they are constructed incontestably prove, that there are few instruments of husbandry capable of more essential improvement than wheel carriages. Nor can we but be surprised at the predilection which has so long prevailed in favour of large teams and waggons, the great object of which seems to be, to try how an immense load of goods may be transported in one carriage, and at one time, without respect to any other circumstance. Merely, therefore, remarking that such a procedure is in direct opposition to the best and most established principles of mechanics—economy, we shall only offer a few strictures on the carts which appear best calculated for the conveyance of hay, and of carrying out manure with the least possible injury to meadows.

The wheel-carriages most commonly used for the various purposes of rural economy, are *waggons*, the structure of which is of different forms and dimensions in various counties. The waggons of Norfolk are of a middle size and height; in that district, however, the farmers avail themselves, during harvest, of the advantages afforded by waggons, without the inconvenience resulting from their weight. With a common dung-cart, and a pair of old waggon shafts and fore-wheels, a carriage is formed, which, as it partakes both of a waggon and a cart, is called an *hermaphrodite*. In this vehicle, the points of the shafts rest on the *bolster* of the fore-wheel, to which they are fastened; a *copse*, or fore-ladder, similar to that which is sometimes fixed upon cart shafts, but longer, is also supported by the bolster, projecting over the horse in front, in the manner of the fore-ladder of a waggon; so that the length and breadth of the hermaphrodite vary very little from those of a waggon.

The Gloucestershire waggons are not so high as those of Norfolk; for, the former having a crooked side-rail bending in a kind of arch over the side wheel, their frames or bodies (in some parts of England denominated the *buck*) are kept low, while the diameter of the wheels is not materially lessened. The bodies are also made wider, according to their shallowness, and the wheels run six inches wider than those of the generality of waggons; in consequence of which, it is obvious that very great advantages are obtained in carrying top-loads.

There is a peculiarly useful waggon employed in the county of Berks: these carriages are greatly superior to the generality of the vehicles occurring in the more western and southern districts, from the neatness of their structure, as well as the facility with which they may be drawn; while they have sufficient strength, without the unwieldiness and weight of the other waggons. But, with all their excellence, as they are now made, the Berkshire waggons are subject to one great inconvenience, by which a considerable portion of time is lost, in turning at the end of swaths, carrying hay, as well as in carrying corn, and many other articles. This disadvantage, however, may be obviated, without detriment either to the strength or proportion of the waggon, by adopting the valuable suggestion recently given in the "Agricultural Survey" of that county, viz. by leaving a space of sufficient depth in the bed of the waggon to admit the fore wheels to lock round in the shortest curve.

A good horse, it may be observed, can draw upwards of a ton, or 2,000 weight; in drawing which a great portion of the animal's strength is exhausted in pulling the waggon, rather than the load it contains, to which his strength ought to be applied. Hence several judicious farmers have availed themselves of lighter carriages, for conveying different articles to and from land, so as in a great measure (and in Ireland, and in a few other places entirely) to supersede the use of waggons. For this purpose the *improved Irish car*, of which the subjoined figure will convey an outline, merits very particular attention.



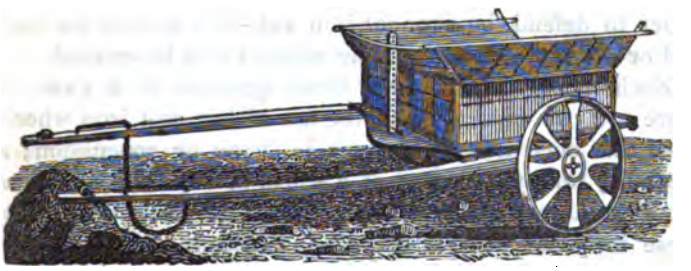
Nothing indeed, Mr. Young remarks, can surpass the amazing speed, with which corn and hay fields are cleared in Ireland, by means of this useful but inelegant carriage. With regard to form, the Irish car is almost square, the bed being only a few inches longer than it is in breadth; and the wheels, which should be at least six inches broad, are made low and broad, have a flat bearing, and are placed beneath the cart.

The benefits to be derived from this machine, which was preferred to any other by the late eminent farmer and breeder, Bakewell, are as follow: on account of its lowness it may be easily filled; when narrow or confined gateways and roads occur, much room is gained by the wheels being placed below the body of the car; and it may be drawn with great facility on soft meadow lands, with less injury than is practicable with any other cart. Another advantage is, that the rims of the wheels being cylindrical, the draught is much inclined; consequently there is more facility and less resistance, and heavier weights

can be drawn; and less injury is done to the land than when conical rims are employed.

But with all the advantages which the *improved Irish cars* above described possess, (and they are confessedly very great,) there are some eminent agriculturists, who, after careful consideration and comparison of their merits, conceive single-horse carts to be preferable. This difference of opinion is not for us to reconcile: it is however certain, that as horses have more power in drawing singly than in a team, these carts are superior to large carriages, by the increased proportion of labour which those animals can perform*.

Mr. Young has given the annexed dimensions of a one-horse cart, which he has, after long experience, found to be the most advantageous, viz. the *buck*, or body, is five feet one inch long, three feet seven inches broad, and two feet deep; the cubical feet amounting to thirty five and a fraction; and the figure hereafter delineated represents an excellent one-horse cart, invented by Lord Robert Seymour, who employs it on his estates with the most complete success:—



In a valuable communication, inserted in the "Annals of Agriculture," (Vol. XXVII.) his lordship remarks, from actual observation, that one horse acting by himself, will perform half as much more work as he can do when coupled with another; so that two horses *separately*, can do the work of three conjunctively. This difference is occasioned, partly by the single horse being so near the load he pulls, and partly from the line of draught being so much below his breast; the wheels of one-horse carts being mostly very low. Besides, when two

* Annals of Agriculture, Vol. XVIII.

horses draw together, one of them is usually inconvenienced by some difference of rate; the horse before or behind him being slower or quicker than himself. On the contrary, a single horse has only his load to encounter, and suffers no inconvenience from the disproportionate height of his companion; nor is it necessary to employ any additional drivers; as, when once accustomed to go singly, horses will follow each other with as much uniformity and steadiness, as when they are harnessed together; so that, on the most public roads in Ireland, one man guides three, four, or five one-horse carts, without any inconvenience whatever to passengers.

The following are the dimensions of Lord Robert Seymour's single-horse cart.—*Body:* across the bottom, two feet eleven inches; inside length, three feet nine inches; height, one foot; sloping top, nine inches.—*Iron wheels:* height, two feet eight inches; rim, three inches and a half in width; spoke, three inches and a quarter at each end, decreasing to two inches at its centre. With a view to furnish a regular supply of grease, his lordship has introduced four cavities or grooves into the boxes, which increase a little towards their centres; and, in order to defend the wrought iron axle-tree against the harder end or extremity of the box, he ordered it to be steeled.

Each wheel weighs about three quarters of a cwt. But there are two objections to the use of low cast iron wheels—first, that such iron is very apt to break on concussion; and secondly, that the course of a wheel of so small a diameter produces a very quick consumption of grease. The first of these inconveniences is effectually obviated, by the ease with which the rims of such wheels may be repaired, by means of wrought iron; which, when riveted to the cast iron, gives to the wheel a degree of elasticity, and thus renders it, perhaps, stronger than when it was recently made. The latter inconvenience is removed by the contrivance above mentioned, for the regular supply of grease.

Plate I. fig. 3. represents a front view of a *drag-cart*, invented by Lord Somerville; selected from Vol. II. of "Communications to the Board of Agriculture."—Fig. 3. is a cart calculated for draught, by a *single* horse in shafts; *b b* is a *friction-bar*, or drag, that is fixed behind by a chain, and before by a tooth-rack, delineated at *b d*, which catches on a staple,

and by means of which the pressure may be regulated by the driver, according to the steepness of the descent: *c* is a toothed rack, fixed in the front of the cart, for regulating the position or centre of gravity of the load. In this figure, the friction-drag is placed lower on the wheel than Lord Somerville originally intended, in order to divide the pressure and friction more equally on the opposite side of the wheel: thus the action on each is diminished, and the risk of over-heating and destroying the friction-bar is rendered less than if the whole pressure were applied in one point at the top of the wheel.

Fig. 4. represents a side view of the same *drag-cart*, designed to be drawn by two strong oxen, with a pole yoke, and bows, the friction-bar being removed. In this figure, a more simple mode is adopted for regulating the position or centre of gravity of the load, as described at *a b* by the curved iron, perforated with holes for receiving a pin, to keep it at any required height: *c* is a small chain to prevent the cart from going too far back in fixing it: and the letters *d d* denote the upper part of the cart, which is extended to contain bulky or heavy loads.

The following are the advantages to be derived from the adoption of the drag here described:—

1. The degree of friction and pressure may be expeditiously adjusted to the steepness of the declivity; so that the cart will neither press forward, nor require much exertion in the draught.
2. The friction is judiciously applied to the wheel, in such a direction, that a given pressure will produce twice the effect in retarding the progress which it would do if it had been immediately applied to the body of the cart, or to the axis.
3. The apparatus is capable of being arranged with such facility, that it may be instantaneously adjusted, without stopping the cart, or exposing the driver to danger.
4. It may also be remarked, that still greater benefit may be derived from this invention, by applying it to *both* the hinder wheels of *waggons*; thus, the resistance may not only be proportioned to the steepness of the declivity,

so as to prevent most effectually the damage done to the high roads, and the unnecessary labour of cattle, when drawing locked carriages down hills; but also (which is of the utmost importance) it will remove the danger of the frequent accidents to which drivers are exposed; and will in future save that time, which is now of necessity lost, in locking and unlocking waggon-wheels.

Before the subject of carts is dismissed, it may not be amiss to notice one or two carriages of this description, which have been used with advantage in various situations.

The first is the *Cornish wain*; which is, perhaps, the simplest of all wheel-carriages, and is adapted for draught either by horses, or by oxen. It is a cart without a *body*, or more correctly, without *sides*; except only two strong bows or arches, that bend over the wheels, to prevent the load from pressing upon them behind: from its lowness, it is easily loaded; and is admirably calculated for carrying home harvest crops; to which purpose it is chiefly applied in that county.

Lastly, a useful *rolling-cart*, has been employed for carrying manure on low lands, during wet seasons*. It consists of three circular pieces of strong elm, two feet in diameter, and each eighteen inches in length, through which passes a strong iron axis, so as to project a few inches on each end beyond the rollers; allowing one inch between each piece, for the conveniency of turning round. On the projecting part of the axis is placed a fixed frame, for sustaining the body of the cart; which may, according to the nature of the soil, be loaded to any degree, or employed for carrying manure, or merely as a roller, on land whereon common wheels cannot be admitted to pass. By means of such rolling carts, the surface of the soil may be frequently compressed, in order that it may be more perfectly consolidated, so that the earthy particles may embrace the roots of the grasses, and retain their proper moisture, on which the luxuriance of such soils in a great measure depends.

In order to prevent the wheels of carts or other carriages, when heavily laden, from making deep ruts in roads, a useful expedient has been suggested by R. Beatson, Esq. It consists

* Moyle, in "Transactions of the Society of Arts," &c. Vol. XIV.

simply in fixing between the other wheels, a *protector* (thus he denominates it) or small roller, or other broad wheel; of which the circumference of the upper part should be almost one inch and a half below the axle-tree, while the lower one ought to be about that distance from the surface of the ground. This roller is to be secured to the axle-tree, so that it shall be capable of supporting the whole weight of the vehicle, in case the wheels should sink into any deep ruts. The size of the *protector* varies according to that of the wheels; but Mr. Beatson states*, that a diameter of two feet will be sufficient for single carts; but that waggons or double carriages will require it to be both larger and broader. By thus raising the roller or protector a small distance above the lower surface of the wheels, the latter will, on good roads, sustain the weight of the load; and, if the middle way or horse-path be firm, they can neither sink into old, nor form any new ruts; as the roller will move in the middle, and consequently afford a more easy draught to the cattle. If due regard be paid to the construction of the *protector*, its additional weight will be inconsiderable; especially when we consider its utility, and the great reduction it may effect, both in the repairing, and in the making of roads.

As wheel carriages are among the most expensive articles of purchase to a farmer, it is of the greatest importance to make them last as long as possible. With this view, Sir John Sinclair has communicated the following receipt for making grease for wheels, *superior* to any other hitherto discovered.

Mix with the ordinary grease used for carriage wheels as much black lead, carefully pounded and sifted, as will bring it to the consistency of any thick soft pomatum, and grease with this. It will last twice as long as the grease commonly applied, or if the motion of the wheels be not very quick, three times as long. The mixture is equally applicable to machines used in agriculture, as to mills, &c.; and has no bad effect whatever in wearing the axle or box. The effect is still further increased, if the axle be iron, and the box brass†.

* Repertory of Arts, &c. Vol. VIII. old series.

† Sir John Sinclair on the Husbandry of Scotland, Vol. II. Appendix, p. 114.

CHAPTER VI.

ON CHAFF-CUTTERS AND BRUISING-MILLS.

VARIOUS machines, under the names of chaff and straw-cutters, have, of late years, been contrived for reducing hay and straw into chaff, and diminishing manual labour; the economy and advantage of which practice have been already adverted to. Most of these are sufficiently calculated for this purpose; but as it would exceed the limits of the present work to enter into a detail of the comparative merits of these implements, we shall, at present, confine our attention to three of those which, from their construction and other valuable properties, appear most particularly worthy of notice.

The first of these is Mr. Salmon's chaff-cutter, of which an engraving is given in Plate II. fig. 1. The letters A A represent two knives, fixed on the inside of the fellies of two wheels B B, which are firmly connected; and the edges of which knives are at an angle of forty-five degrees from the plane of the wheel's motion. And these knives are so arranged, that they are acted upon by the springs C C, which are so adjusted as to give them the degrees of pressure, against the box, requisite to cut the straw: with a view to prevent them from coming too forward, and thus producing an unnecessary friction, wedges are placed beneath the staples *a a*, which must be drawn out as the knives wear, so as to facilitate their progress; by which expedient new knives may be substituted for old ones, as occasion may require, as they will always be regulated by the springs. D is a round block of wood, fixed to one side of the wheel, having four holes and a moveable screw: to this block is fastened, by means of screws, one end of the feeding arm E, that runs in nearly an horizontal direction to the cross-bar F, at the end of the box G. This end is attached to the cross-bar by the pin *b*, which may be shifted to five different holes in F; so that, by means of these, and of the four holes in the block D, *twenty changes* may be obtained in the length of the chaff.

The straw or hay is brought forward by two rollers in the box G, which are separately delineated at figure 2. of Plate II.;

Fig. 1.

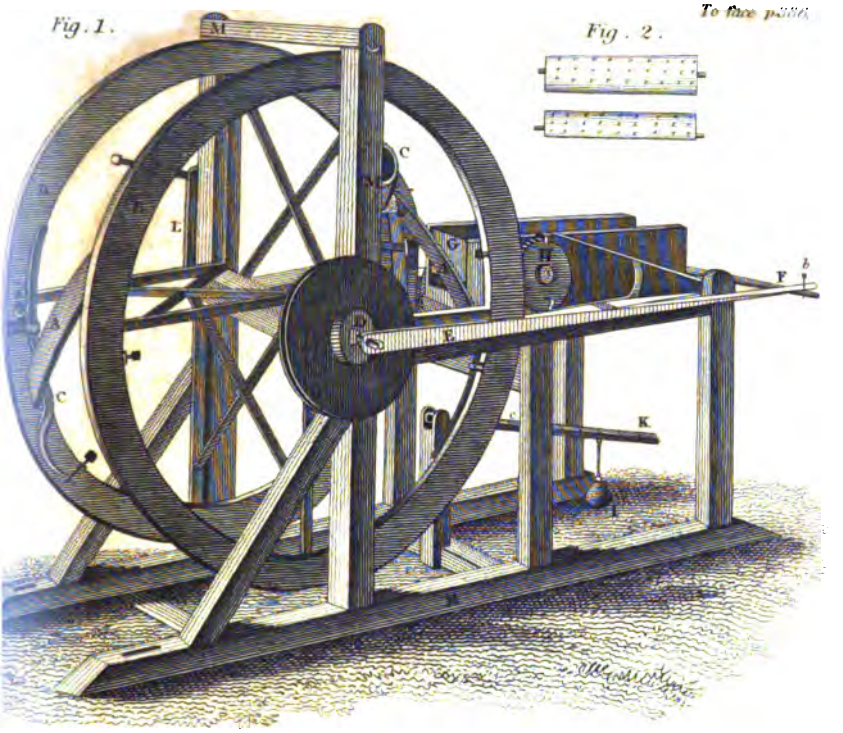
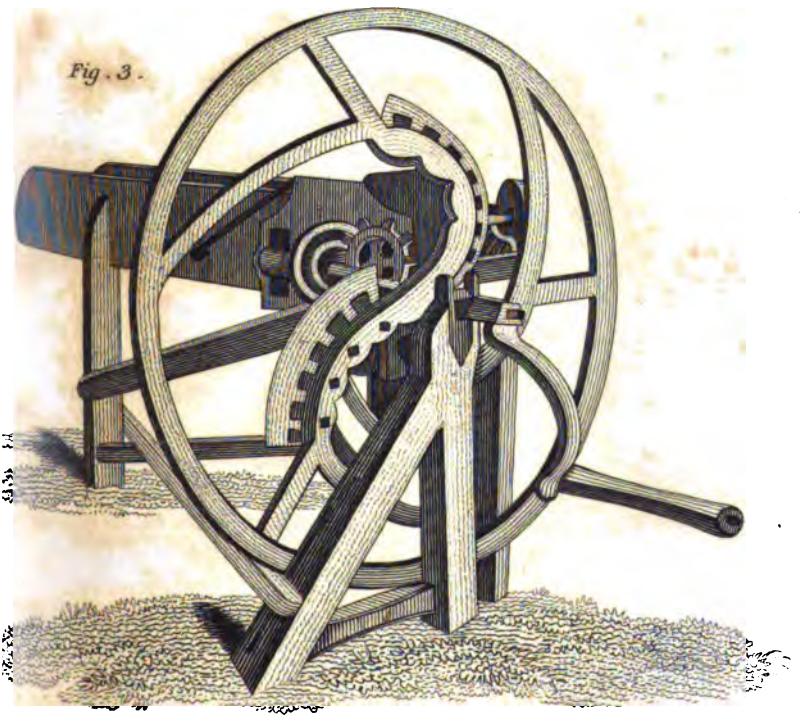


Fig. 2.

Mr. Salmon's Improved Straw-Cutter.

Fig. 3.



Mr. Mc. Dougale's Chaff-Cutter.

and which are turned from the cut side, by the ratch wheels H, (one being on each side of the box,) and move more or less quickly, according as the stroke is given to the cross-bar by the feeding-arm and wheel. Thus, while the knife is cutting, the straw remains at rest; and, on removing the cross-bar F, the supply immediately ceases, although the motion of the knives may continue. I is a pressing weight, suspended below the box, which may be more or less powerful, by shifting it on the *bearer* K, whence it hangs; this weight may also be inclined to either side, according to circumstances, and will contribute to force the straw towards the knife, while it counterbalances the ratch-wheel of the upper roller. Near the *fulcrum* of this bearer there is a fixed chain, represented by the dotted line E *e;* the upper end of which is connected with a roller, having at each end a small iron bar, that is attached to the end of the upper spiked roller: thus the straw is uniformly pressed between the two cylinders. S is a winch, that serves to turn the machine. The letters M M M M denote the frame of the machine. Figure 2. delineates the two rollers, already noticed in the description of the box G.

In order to make use of this chaff-cutter to the best advantage, Mr. Salmon, the inventor, proposes to place a second box at the end of the first: such second box may be made of any length, and suspended by a line and counterweight; by means of which its end is brought down to a level, while it is filling with straw, and then drawn up, so as to give the second box a declivity; a contrivance by which the straw is brought more expeditiously forward. The advantages resulting from this additional improvement are, 1. The ease with which straw may be cut; and, 2. A very considerable saving in point of time; as it will not, in this case, be necessary to stop at intervals, in order to *feed* the machine. The price of Mr. Salmon's chaff-cutter, we understand, is about twelve guineas.

In Plate II. figure 3, is given an engraving of a patent chaff-cutter, invented by Mr. Macdougal, of Oxford-Street, by whom we have been favoured with an original drawing of it, for the use of this work. It possesses, in a superior degree, *facility in working*, so that much time is saved in labour. The hay, straw, &c. intended to be cut into chaff, may be pressed as hard as the labourer pleases, by merely placing a weight nearer to the end of the lever. It should be observed, that in the common

chaff-cutters, an endless screw is usually inserted; for this Mr. M. has, with great judgement, substituted a spiral groove, by which excellent contrivance he has in a great degree removed friction, so that the lever may rise to any height, without deranging the order of the machinery. Should this straw-cutter, however, be broken or injured, through any accident, or the carelessness of servants, Mr. Macdougal has been especially attentive so to construct his implement, that it may, in such case, be easily repaired by any common mechanic; an important advantage this, which constitutes one of its chief excellences, and in which the generality of chaff-cutters are miserably deficient.

A third useful machine for cutting straw, is delineated in Plate III. figure 1, which has been obligingly communicated by its inventor, Mr. Thomas Pasmore, of Doncaster, in the county of York. As the component parts of this valuable implement are specified in the engraving alluded to, we shall only observe, that repeated trials have satisfactorily evinced its efficacy, for the purpose of cutting straw for cattle: and "the straw-machine, with exertion, will cut one bushel of chaff per minute." A peculiar advantage, attendant on this machine, is, that it is not liable to be put out of order; and, from the arrangement of its different parts, it will not *choke* or become clogged; a defect justly complained of in the chaff-cutters commonly in use.

Having, in the course of the preceding pages, adverted to the benefit resulting from the feeding of various descriptions of cattle with pease, oats, barley, and other vegetables, when bruised into meal; we cannot conclude this chapter, without calling the intelligent farmer's attention to Mr. Pasmore's *mill for splitting beans, and crushing barley, oats*, &c. For this useful contrivance, as well as for his straw-cutter, Mr. P. obtained a patent, and has favoured us with an accurate delineation of it. The constituent parts are pointed out in Plate III. figure 2, and the letters of reference there given. From the simplicity and durability of its construction, it is not liable to be put out of order; while it unites uncommon powers of execution, inasmuch as, "with exertion it will crush one bushel of malt in less than four minutes—beans, oats, barley, &c. in proportion."

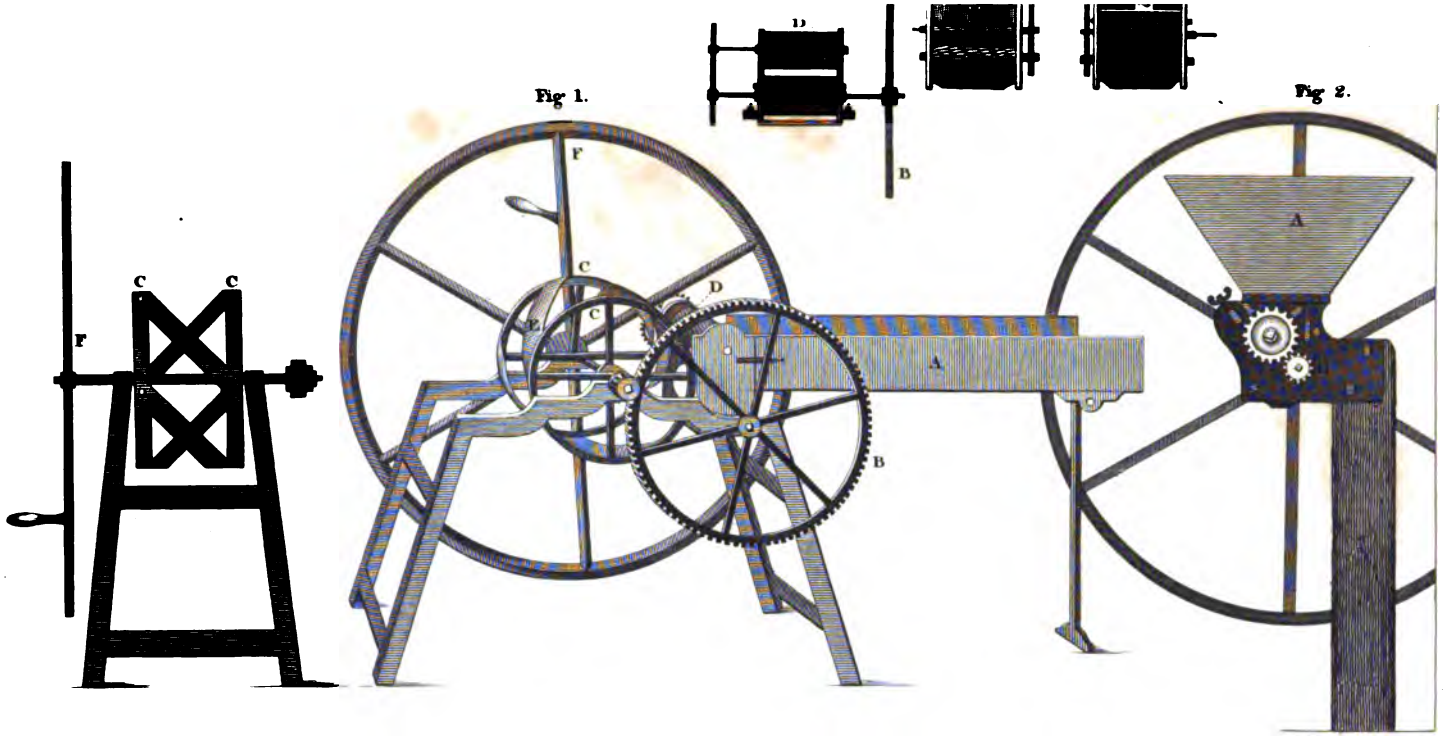


Fig 1. PASMORE's PATENT MACHINE for Cutting Straw.

A *Feeding Trough.*
B *Spur Wheel.*
C *Heads to which the Knives are fastened.*
D *Rollers which conduct the Straw.*
E *Knives which cut the Straw.*

Fig 2. PASMORE's PATENT MILL. for splitting Beans, crushing Barley, Oats, Malt &c.

A *Hopper to contain the Grain.*
B *Side view of Mill as fix'd to Post.*
CC *Two Rollers that cut the Grain.*
D *Screw that raises the top Roller for different Grain.*
E *Bush view with Screw that raises the Upper Roller for*

CHAPTER VII.

ON FIELD IMPLEMENTS.

PLOUGHS are, perhaps, the most important implements used on a farm; and, as the soils of farms are necessarily of various natures, so are ploughs diversified in their construction, and the purposes to which they are applied. As, however, they are chiefly applicable to arable farms, we shall notice only the principal of those which have been invented; and which are, of course, most deserving of attention.

The ploughs in most frequent use, are those denominated *swing-ploughs*, which are not provided with wheels; consequently they are not liable to be clogged with dirt or mould; and, being effective implements, they are peculiarly calculated for strong lands, when judiciously guided, as the mould-board is so curved as to make less resistance in turning up the earth; and, of course, requires a smaller force to draw the implements. Swing-ploughs are in general use throughout Great Britain: in Scotland they are almost universally adopted, and rarely more than two horses are now made use of. They are yoked abreast, and thus the advantage of their full strength is obtained; for when yoked one before the other, or harnessed at length, it is hardly possible that they can pull equally. The power of the fore horses must be exerted, to reduce the traces to a straight line, which cannot be done without pressing on the back of the hindmost horse, where the angle is formed, and consequently greatly distressing him. Hence the superiority of ploughs drawn by two horses (or oxen) abreast, and of single-horse carts. In ploughing also, less time is lost in turning, especially in small fields, where the ploughs are drawn by two horses abreast; so that they will, with equal ease, do at least one tenth part more work than the same cattle will perform when placed in a line *.

Of *wheel-ploughs* there is a great variety adapted to every modification of soil: and though these are less calculated for

* Sir J. Sinclair on Scottish Husbandry, Vol. I. p. 72.

the expert than for the inexperienced ploughman, yet (notwithstanding the obstacles presented by their weight and increased difficulty of draught) they deserve to be introduced on stiff and tenacious soils, and, in short, wherever that can be advantageously effected; as they are not easily thrown out of the ground, and at the same time compensate for the additional expense of their cost, by their great expedition in work.

For breaking up fresh grounds, the *double wheel plough* is used in some of the midland counties, being drawn by five horses, and attended by one man, in tolerably level soils, which it divides as well as two single ploughs. It is likewise employed, as also is the common single-wheel plough, in Staffordshire, where the latter has received an important improvement, by the addition of a *flay*, or iron earth-board, which is firmly screwed to the coulter. The advantage of it is, that in breaking up the turf, the sward is cut off, and turned into the furrow, when it is immediately covered with earth. Thus, by the assistance of one additional horse in the team, the soil will, at one ploughing, in appearance resemble a fallow, and may be harrowed with nearly equal facility.

On stiff and tenacious soils, no implement is, perhaps, better adapted than the *Herefordshire wheel plough*, the share of which is piked; in case, however of very strong land, the well known *Kentish turn-wrest plough* is an instrument of great strength, especially where deep ploughing is requisite, on dry, rocky, and hilly situations; as it turns the soil to a considerable depth, and lays the furrow-slice perfectly level, without making any opening in the seam.

Another admirable implement for breaking up every kind of land, is the *double*, or *two-furrow*, *swing* and *wheel plough*; which was, we believe, invented by the late eminent Mr. Duckett, but has received very material improvements and additions from the hand of Lord Somerville, especially in the mould-board. It would, however, lead us into too wide a field of discussion to detail the various parts of this machine without the aid of several engravings. As its name implies, the two-furrow plough produces two furrows *at once*, and appears to be best calculated for light and level soils, particularly for stirring ley-grounds; and, as these cannot be laid too flat, or *seed earths* be laid too much on an edge, the tool may, by means of the improved mould-board, be easily adapted to either purpose. The

chief advantages, however, resulting from the use of the two-furrow wheel-ploughs, are the saving of attendance, (that of one person being altogether dispensed with,) and the quantity of work they can do in a given time, which is nearly *double* that performed by common ploughs, with but little addition to the team; though, in strong and stony soils, great power of draught is necessary.

The *paring plough* is a well-known instrument, of indispensable utility where the practice of paring and burning land is resorted to, as in the conversion of waste lands into a state of tillage; though that practice has, in some cases, been periodically employed on cultivated ground. This implement is so made, as to pare off the surface of the earth to any requisite depth.

The *trench plough* is a skim-coultered plough, invented or improved by the late Mr. Duckett, already mentioned. It is furnished with two shares, one directly over the other; so that one narrow, superficial furrow, may be drawn from the surface of the ground, while another is taken off beneath, at a moderate depth. The trench-plough is admirably calculated for ploughing in green crops, or long muck, by way of manure; whatever is thus turned in being really covered, so that the surface is entirely cleared from all weeds, and fit for the reception of any succeeding crop. Further, should the surface of the soil be *foul*, it may be turned under, and fresh soil brought up from the depth of ten inches, by employing the force of three horses; thus, the earth being loosened, the roots of plants are enabled to strike downward without encountering any obstruction; and, while the ground is drained of superfluous moisture, it is exposed to the influence of the air, and consequently greatly ameliorated.

To the list of ploughs for breaking up stiff, clayey lands, may be added a strong, effective implement, called a *miner*, from the circumstance of its opening, or rather *loosening*, soil to a great depth. It has simply a share, without any mould-board or plate whatever; and may be advantageously employed for eradicating those weeds which take deep root.

The original *drill plough* was invented by Jethro Tull, a man whose talents and ingenuity, ever devoted to the welfare of his country, will be held in grateful remembrance so long as agriculture is considered as a primary object of attention. Since

his time, various improvements have been made and suggested; among those more deserving of notice are,

1. Mr. Young's, which is asserted to be calculated for the stiffest soils, and to deposit seed in drills cut through clay-fields, without any previous ploughing*.

2. Mr. Amos's *drill plough* is stated (in his treatise, entitled the "Theory and Practice of Drill-husbandry," 4to.) to sow any kind of seeds, in any quantity, at any required depth, and to perform its business expeditiously, and with facility of draught.

3. Mr. Cook's improved drill is a useful implement, which has been found to answer the purpose on dry soils, and in some cases with equal advantage on strong, clayey, and loamy lands†.

4. Several useful improvements and alterations in drill-machinery have been suggested by the late Dr. Darwin, and also by Mr. Swanwick, of Derby‡; all of which contrivances being too complex for description, to convey any correct idea of them, we trust this notice of them will be sufficient. We pass them, therefore, omitting numerous common drills, which have been found to answer their respective purposes very well, and proceed to notice two drill-machines, the simplicity of whose mechanism—(and simplicity is, in the present case, of primary importance)—facility of working, and comparative cheapness, render them more worthy of general notice.

The first of the implements alluded to is, the Rev. Mr. Munnings's *turnip-drill*, for the invention of which he was honoured with a premium by the Society of Arts§; and of which the annexed figures will convey an adequate idea.

* Annals of Agriculture, Vol. III.

† The minute account of this machine, and of its application, has been published by Mr. Cook, in a small tract entitled "Drill-Husbandry perfected," 12mo.

‡ Phytologia, 4to. p. 608, and foll.

§ Transactions of the Society for the Encouragement of Arts, &c. for 1801.

Fig. 1.

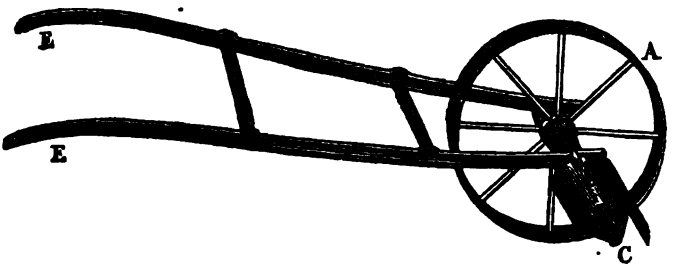
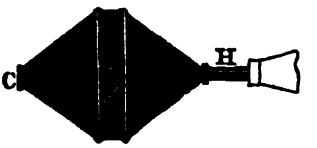


Fig. 2.



The machine consists of a barrel-shaped box, that is fixed to the axis of a wheel, about twenty-two inches in diameter, and vertical with such box; during its revolutions, it deposits the seed through certain openings in the middle of the barrel, that are about fourteen inches apart.

Fig. 1. A represents the wheel, with an iron rim.

B is the tin barrel, or seed-box, that is fixed to the axis of the wheel; C the aperture through which the seed is introduced into the box, and which opening is afterwards closed with a cover.

D is a semi-circular tin plate, intended to remove all impurities and extraneous matters from the seed-box.

The letters E E denote the two handles of the implement.

Fig. 2. F describes the seed-box B, on a larger scale; G the holes in the tin barrel, or seed-box, through which the seed is dropped upon the soil; H represents that part of the wheel's axis, to which the seed-box is attached.

In his communication to the respectable Society above named, the inventor considers this turnip-drill to be greatly superior to any former machine, from the circumstance of its depositing seed so immediately after the plough, as to preserve all the good effects of the first evaporation, which, in his opinion, is greatly conducive to the vegetation of minute seeds. Thus, in six acres

of drilled turnips, there was not a deficiency of six square yards: whereas, on half that quantity, or three acres broadcast, before rain fell, not *one-half*, perhaps not one-third, of the seed vegetated.

Fig. 1.

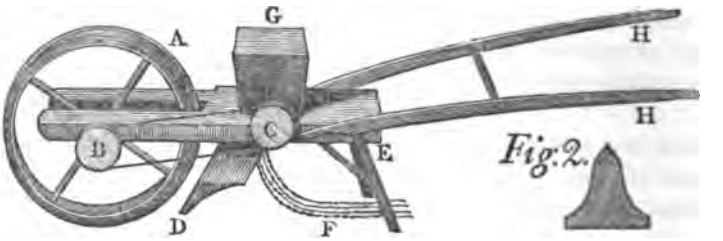
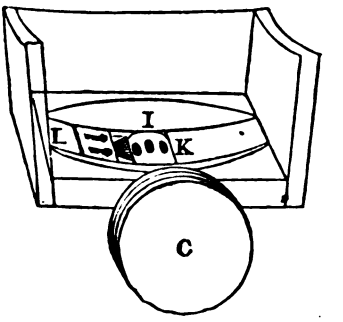


Fig. 3.



These figures represent Mr. Knight's *improved drill-machine for sowing turnips*, for the invention of which he was also honoured in the same year, and by the same Society, with a silver medal.

Fig. 1. A is an iron wheel, which, running on its edge, formed by two concave sides, makes the groove in which the seeds are deposited.

B is a wheel which moves on the same axis as the wheel A, and which, by means of a strap, turns another wheel, C; that gives out the seed.

D is the tube through which the seed falls into the channel made by the iron wheel A; E the feet of the machine.

F represents six lengths of a jack-chain, which Mr. K. has found to cover the seed perfectly, and conceives to be preferable to any harrow, as it cannot be impeded in its course by the

loose straw that often occurs on the surface of recently-manured lands.

G the seed-box; H H the handles of the implement.

Fig. 3. is a delineation, on a larger scale, of the seed-box G, fig. 1. The wheel C is the same in both figures; it is fixed on the axis of the cylinder I, the surface of which is pierced with holes, described at K, for dropping the seed. This cylinder revolves within a groove at the bottom of the box, to which it is so firmly fixed as not to admit the passing of seed, unless it be delivered by the holes K.

L is a *strickler*, or small brush, that rubs against the cylinder, for the purpose of dislodging any seeds that may remain in the holes. The seeds fall into the tube beneath the cylinder, from which they are conveyed into the furrow, or channel, made by the indenting rim of the iron wheel A, and are then covered with soil by the loose jack-chains F.

Fig. 2. is a front view of the wheel representing its edge; the angle which forms that edge must be made more or less acute, and the machine be made proportionably strong, according to the stiffness or lightness of the soil. Mr. K. states, in his communication to the Society of Arts, that he has occasionally added leaden weights over the axis of the wheel, but adds, that they will be seldom wanted; as he has tried the implement on various soils, and with equal success. And as the delay of a few days often materially affects the future growth of a crop of turnips, great benefit may be derived from the use of this machine, at a time when the teams are occupied with other farm business.

The labour of using Mr. Knight's drill-machine is so easy that one man may, upon an average, drill four, or sometimes more statute acres in one day; the rows being eighteen or twenty inches asunder, and the plants six inches distant in each row. It will, however, be proper either to harrow the ground across or to roll it, before the implement is used, that the labourer may see the rows he has made; but Mr. K. observes, that he always found the crop succeed better after being rolled than after the use of the harrow, even in very strong lands.

We have been thus, we trust not unnecessarily, diffuse in describing the two machines last noticed; as, independently of the simplicity of their construction, they are obviously capable of being applied to the drilling of other seeds than those of tur-

nips, by varying the proportions, or enlarging the apertures, of the seed-box, as circumstances may require; but so numerous have been the improvements, or rather, perhaps the alterations, recently made in the drilling-machines, that our further space will only allow us to notice a simple implement, denominated a *hand-drill*, or drill-barrow, which is well calculated for distributing small seeds. The principal part of it is a wheel, about twenty-two inches in diameter, and made of solid deal, on the axle of which is fixed a notched roller, two inches and three quarters in diameter, and two inches in length, that turns in the fore part of the drill-box. The quantity of seed to be distributed is regulated by a slider, which moves upward and downward in the fore part of the box, by means of an adjusting screw fixed at the top, and has a strong brush, or strickler, that projects from its lower end, and sweeps upon the notched roller. There is also a sluice, or slider, which lies flat on the bottom on the inside of the drill-box, and projects between the two handles of the drill, so as to be within the reach of the person guiding it; who, pushing the slide forwards, thus perfectly covers the notched roller, and prevents any seed from being dispersed while turning the drill at the end of the ridges. With this machine, it is said, a *boy* can drill from two to two acres and a half in one day, the rows being twenty inches asunder. The implement here described is much used in the lowlands of Scotland; but, as it sows only one row at a time, much advantage would be derived in point of despatch, and especially in the saving of labour, if it were constructed so as to drill several rows at the same time, and the apertures also made capable of being regulated with regard to the distances for putting in various seeds.

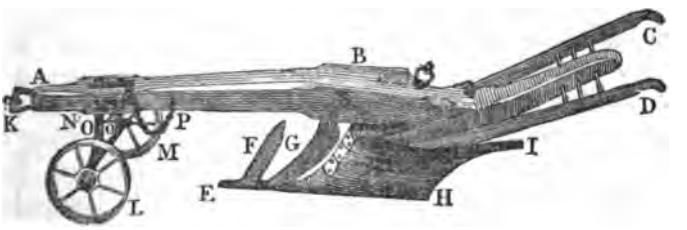
Having thus described the most important ploughs in use for the more general branches of husbandry, we proceed to notice those which are more peculiarly calculated for affording assistance in the DRAINAGE of lands.

One of the most useful, and least expensive ploughs, of this description, is the *mole-plough*, invented by Mr. Adam Scott, who was, in 1797, honoured with a premium by the Society of Arts. It is composed of a coulter that is fifteen inches long, by two and a half wide, for the purpose of cutting the sward; behind this coulter is fixed a horizontal cast-iron cone, twenty inches in length, and two inches and a half in diameter at the

base; to the middle of which is fastened an upright bar, two feet in length, and three inches and a half in breadth, with a sharp edge. In pleasure grounds, and other situations, where the surface of the land is an object of regard, this plough will be found very useful for making temporary drains, as the mark made by the coulter speedily disappears. A man and boy, with four horses, may, it is stated, with ease, drain thirty acres a day: it will, however, be necessary, in using this implement, to make an open ditch at the lower side of the ground intended to be drained, for carrying off the water from the furrows or drains, which should be formed at the distance of ten or fifteen feet, in straight lines. And it is suggested, that in very wet lands, or seasons, it may be advantageous to employ eight, nine, or a larger number of horses; because each animal drawing less, the feet will not sink so deeply into the ground.

This implement has received some improvements from the hand of Mr. Watt, who obtained a patent for the same in 1797. The most material alteration is, that Mr. Watt has applied a cast-iron, or steel, rolling cutter in the beam of his drain-plough, instead of the *coulter*, which Mr. Scott has fixed in the usual manner by means of wedges; three cutters are also added, for the purpose of being occasionally substituted for the rolling cutter. In drawing this implement, which is much used in the midland counties, from four to eight or more horses will be necessary, according to the nature and depth of the ground intended to be drained. For general purposes, the common draining-plough, which is too well known to require minute description, is an effective implement.

Another *drain-plough*, which deserves more particular notice, is that invented by, or under, the direction of the late Duke of Bridgewater, and which is delineated in the subjoined cut.



A B represent the beam of the plough.
C D are the handles.

E is the *sock*, or share.

F is the coulter, or first cutter of the sod which is attached to the share.

G is the second cutter, or coulter, which separates the sod from the land, and forwards it through the open space between F and G. This second cutter is connected with the share, and also with the beam.

H I the sheath of the plough.

K is the bridle, or muzzle to which the swingle-tree is fastened.

L M two cast-iron wheels, which may be raised or lowered by the screws N pressing on the flat irons O O, to which the axis of each wheel is fixed. The object of these wheels is to regulate the depth to which the share is to penetrate the soil.

P is a chain, provided with an iron pin for moving the screws at O.

In his communication to the Society for the Encouragement of Arts * the Duke of Bridgewater observes, that the best time for making use of his implement is about Michaelmas, or immediately after the grass is eaten off; between which period and Christmas the whole operation ought to be completed. On clay soils, that have never been drained, six horses will be requisite to draw this drain-plough; but in succeeding years, four horses only will be necessary, to draw it through the same furrows or gutters. In stiff, flat lands, the implement cannot go too deeply into the ground; though, on declivities, five inches will in general be sufficient; but, on soft and light soils, it ought to be directed as deep as possible, as the sides are apt to crumble and fall into the gutters.

Scarifiers and *Scufflers* are implements which have only been employed within a few years. Their size and form are various; and, as it would be impossible to convey an adequate idea of their construction without the aid of numerous engravings, we shall only notice concisely those held in most esteem. Such are Mr. Cook's scarifier and scuffler, which form part of his drill-machinery, the full price of which is 40*l.*—Mr. Lester's *cultivator*, who (in 1801) obtained a silver medal from the Society of Arts for his invention; the merit of which has, however, been contended, it having been asserted to be known long since in North Britain, under the name of an *edget* †.

* Transactions, Vol. XIX.

† Farm. Mag. Vol. III.—The cultivator has been simplified in Scotland

Mr. Haywood's *extirpator*, or *scalp-plough*, which is a useful implement of the kind, and well calculated for destroying weeds, and clearing land for the reception of seed. It consists of a beam seven feet long, which is furnished with two handles; the shares are eight inches broad, nine long, and are fastened to *stalks* about ten inches high, and eleven inches apart. It possesses the advantage of being fixed to the wheels of a common plough; does much work in a short time, as it may be worked by any person capable of directing a plough: and will turn over one acre an hour without fatiguing the teams, which should consist of two, three, or more horses, according to the nature of the soil.

Mr. M'Dougall's *scarifier*, of which the annexed cut has been made from an original drawing,

is a cheap and effective implement, that has been employed with great success.

by Mr. Dudgeon of Broom-House, East Lothian, by whom it has been adapted to the most valuable purposes of agriculture. It is now termed a *Grubber;* and its operation is thus described in a communication made to Sir John Sinclair by its improver.

The Grubber "is successfully used for turning up any couch or other noxious weeds, whose roots may be turned down by ploughing. When a field has just been ploughed, harrowed, and gathered, the farmer finds a great proportion of the couch, &c. turned down, out of the reach of any common harrow; and, if practicable, would plough it again to hasten the process of fallowing; but *that* he cannot do without neglecting his other fields. In this case, therefore, he has recourse to the grubber, which effectually accomplishes his wishes in raising every thing to the surface. When this object is attained, harrowing and gathering are again successfully employed, and thus a constant succession of important labour is accomplished in a much shorter period than was ever done before. In light lands, if the ridges are once properly formed to the mould required, the grubber is capable of cleaning the land effectually, with no other ploughings than

The practice of *scarifying* grass lands, indeed, is of late date; but, where the beauty of the lawn is not regarded, it is very beneficial, as it conduces greatly to increase the quantity of hay by loosening the surface, so that the roots have fresh power of vegetation, and, being cut, they are found to *tiller*, or throw out new shoots. The use of the scarifier is particularly advantageous before the laying on of manure, by the ground being opened so that the roots immediately receive whatever quantity of manure may be laid on, by which means a saving in that important article is effected, as a small quantity, so applied, goes as far as a much larger proportion strewed after the old practice.

A useful contrivance has been invented by Mr. Parkinson, an ingenious and practical agriculturist *, for the purpose of eradicating tap-rooted weeds, which often resist the action of the scarifier, when its edge is blunted, so that they are dragged down, and continue to vegetate. This, too, is asserted to be superior to the scarifier, or plough, for such purpose; but can only be employed on light land, where the fallow is well broken, and nearly clean of twitch or couch. Mr. P.'s implement is of a triangular form, having a beam, beneath which are two small wheels to run before it, in the same manner as in the Norfolk plough. There are three coulters, under each of which is riveted a share, about fourteen inches in width, and the point of which is made sharp like a fleam. These coulters penetrate to the same depth as a plough; and, without materially moving the soil, cut up thistles and other weeds much better than any other implement which has hitherto occurred to his notice. And, in case those weeds are very numerous, Mr. P. employs a

what are necessary for covering the manure which may be ultimately applied. But in the case of a strong soil, it is necessary to have it more pulverised by a few ploughings, before this implement can produce its proper effect. When it is required to level ridges by cross-ploughings, nothing can exceed the grubber for that purpose. In all cases it requires four horses; but, except there is much rough sod upon the field, or an uncommon quantity of couch-grass, only a steady and attentive driver is required, and never more besides the driver, but a boy with a plough-staff in his hand to push away any thing that is likely to occasion any interruption to the prosecution of the work."—Sinclair's Husbandry of Scotland, Vol. II. (Appendix) pp. 163—166. The price of this effective implement in *Scotland* is from 6*l.* to 8*l.* 8*s.* (and, if it be made very strong, about 11*l.* 11*s.*)

* Experienced Farmer, Vol. I.

beam with one wheel, into which he puts one of the coulters, to cut between the rows of the drills. This *extirpator* (for so we think it may with propriety be termed) will penetrate to any depth that may be required; and that which is provided with three shares will, according to the inventor's statement, do as much work in one day as three ploughs.

Hoes are useful tools, which have long been employed both for garden and field culture. They may either be used by hand, or drawn by *horses*. In the latter case they are called *horse-hoes*, and are well calculated for hoeing drilled crops: of this description are,

1. The tool invented by Mr. Amos, which has moveable shares, so that it may be varied according to the distances at which the seed may have been drilled:—

2. Mr. Cook's horse-hoe, forming part of his drill machinery; as, however, his shares are fixed, this circumstance, perhaps, renders his implement, though otherwise an admirably effective one, less eligible than the former:—

3. A valuable horse-hoe, invented by the late Mr. Ducket. It is made entirely of iron, including the carriage, and is composed of two common plough-shares, which work from twenty to twenty-four inches of ground in breadth, in proportion as they are winged. These shares are fastened, by means of wedges, into a twisted beam, and the whole is put together with such solidity and strength, that the implement may be worked with four horses at any requisite depth. These hoes are chiefly calculated for clearing bean and pea stubbles for the plough, which purpose they attain with such effect, that it is stated the land may be sown, even although the ground may not have previously been ploughed.

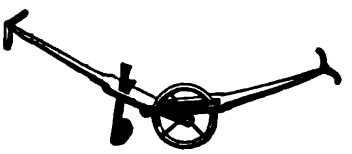
Among the various *hand-hoes* that are deserving of notice, those invented by the late Mr. Ducket are eminently useful in mellow soils. He has availed himself of a short handle, towards the bottom of which is an iron ring, or loop, for holding a strap that is fastened round the waist of the labourers as they walk backwards. This circumstance, together with the heavy iron work, gives the implement much power, and renders it very effective *.

* See "Communications to the Board of Agriculture", Vol. II. in which is given an engraving of Mr. D.'s *hoe*. Similar implements have long been used in Portugal for hoeing the vineyards situated in strong soils; they are

The *scuffle* or *Dutch hoe*, is used principally in cutting up weeds, and loosening the soil around esculent plants. It is of various sizes, each being fixed on handles from five to six feet in length; the cutting plate, which is seven or eight inches wide, being open in the middle, that the earth and weeds, in hoeing, may fall through the open part without impeding the operation.

Another useful implement, of this description, is the *prong-hoe*, which is chiefly used for the purpose of hoeing or breaking the ground, near or among the roots of plants. It consists of a handle, five or six feet in length, to which are attached two hooked points, six or seven inches long; when stricken into the soil it will stir and turn it to the same depth as a plough, thus answering both intentions, viz. that of opening the ground, and of cutting up weeds. The prong-hoe is an effective implement, particularly in horse-hoeing husbandry, when the plough can only come within two or three inches of the rows of vegetables; as, by means of it, the land may be stirred to the very stalk of the plant.

The next implement belonging to this class, which is more peculiarly worthy of notice, is Mr. M'Dougall's *improved hoe*, represented in the subjoined cut.



It consists of two principal parts; the first of which is a beam of wood, having at its fore-end a semicircle that forms two handles, between which one man walks and draws the tool forward. At the other end, this beam is divided, and moves on two small gudgeons, by which it is accommodated to the height of the hands of the person drawing, and room is allowed for the movement of a wheel. The further end of the opposite beam is held by another person, who guides the hoe, and regulates the depth to which it enters the ground, at the same time assisting its action by pushing it forward. The fore-end of this beam is likewise divided, so as to admit a wheel to run between the sides, which serves to regulate the depth, and at the same time to ease the draught in working this instrument. The hoes, or

forcibly recommended to the notice of British agriculturists by Lord Somerville, in his "System followed during the last two years by the Board of Agriculture", &c. 8vo. 1800.

cutting plates, are made of cast iron, and mortised in the hinder beam by means of a proper wedge; their size and dimensions may be varied according to the peculiar nature of the work.

A very valuable "*turnip-hoe*, or more properly turnip-chopper", has been also introduced to the notice of the farming public by Mr. Malcolm *, which deserves to be adopted in every district where the feeding of cattle constitutes a primary object of agricultural labour. "The hoe is first made like the common nine-inch garden-hoe, forming an oblong square, with an eye to receive the handle: from the centre of the first hoe, another hoe crosses it at right angles; but this second hoe is not made solid as in the first common hoe, but is made like a Dutch hoe, the centre-part of it being open the whole length of it. The turnip being pulled out of the ground by the angles of the hoe, is immediately struck with it about the centre, which divides it into four; and, if these four pieces are not small enough, the stroke is repeated upon each of the pieces, until they are sufficiently so." This implement will be found very useful; but Mr. Malcolm is of opinion, that it would be greatly improved "by having two stoutish prongs on the back or reverse part of the hoe, proceeding from the neck of the eye: these prongs would pull up the roots with infinitely more expedition; and the increased weight of the hoe would rather be in its favour, by lessening the force necessary to split the roots. The whole expense", he adds, "is so trifling, and the simplicity of it is such, as greatly to enhance its value."

By means of this tool the shepherd may take up the turnip, and slice it by one or more strokes, into as many divisions as, according to the size of the root, each piece may be sufficiently small either for lambs to take into their mouths, or (which is of more immediate consequence) to enable the *crones*, or old toothless ewes, to fatten with nearly equal facility as the young ones do; as they are capable of picking up these pieces, and by a toss of the head can throw them into the further part of the mouth, to the grinders. Thus they are enabled properly to masticate the root, when they would otherwise find it very difficult to supply themselves with a sufficient quantity of food, by

* Compendium of Modern Husbandry, Vol. I.

the usual method of nibbling the turnip, either while it is in the ground, or after it is picked up.

Harrows are implements of essential importance in the management of farm lands, not only for the purpose of covering the seed with earth, but likewise for pulverizing the soil, previously to its reception of seed. The improvement of harrows has, of late years, become an object of considerable attention, and numerous alterations bave been introduced to suit it to various soils and different modes of tillage; but the only instrument of that kind employed upon grass-land is the simple contrivance denominated the *bush-harrow*, which is chiefly used for the purpose of harrowing in dung or seeds. It consists simply of a frame, the fore-part of which is raised by means of two wheels, and into which frame some sort of bushes are interwoven.

Rollers are differently made, of wood, stone, and of cast iron; and of various sizes, according to the respective purposes for which they are used. The common rollers generally used for rolling pasture-lands are from fifteen to twenty, and thence to thirty inches in diameter, and about six feet in length. In constructing these instruments, it will be advisable to make the cylinder of a small diameter, not less than twelve, nor more than thirty inches, as the degree of pressure necessarily decreases, if it rest on too large a surface at one time, unless an additional weight be put on the *frame*. This part of the machine ought, therefore, to be very strong; though it will be preferable to place open boxes, or small cars, upon the frame for such purpose, which will, at the same time, serve to receive any substances that may be picked off the soil. Should, however, the land be stiff, and difficult to reduce, the addition of *spikes* to the roller will prove of essential utility in bringing the earth to a fine tilth. In Scotland, Aberdeenshire granite has been found preferable to every other material for rollers, being much cheaper, infinitely more durable, and so weighty, that it may be made of as small a diameter as is necessary.

It is a common, and very commendable practice, in rolling meadows, to place a bush-harrow in front of the roller, by which means the two operations are simultaneously performed. A very simple contrivance in the frame of the roller, with which every ploughman is acquainted, is sufficient for the purpose.

Various other supposed, but really unimportant, improve-

ments have been attempted in the construction of rollers; such as the addition of deep iron circles for the purpose of indenting the soil, and sowing on the drills so formed; but they have seldom answered the expectations of the inventors.

The sole objects of rollers are to crush the clods in fallow ground; to compress the soil round seeds that have been recently sown; and to level meadow-land by the reduction of mole hills and other extraneous matters, and thus to prevent any obstruction to the scythe: for all which purposes *weight*, in proportion to the particular object in view, is all that is really necessary.

BOOK THE EIGHTH.

ON THE CULTURE AND MANAGEMENT OF GRASS-LAND.

CHAPTER I.

ON THE SIZE AND SHAPE OF FIELDS.

In the article of expenditure on a farm, the items for fences usually form a very prominent feature. There is no doubt but that much unnecessary expense is incurred by dividing the fields into too small inclosures. The size of fields is in many instances regulated by the terms of the lease; but, if the farmer were sometimes to sacrifice a little taste or ornament to the judicious classification of fields, according to the soils they respectively contain, his profit would be much greater. The extent of fields must further be regulated by the size of a farm, and the uses to which they are to be converted.

Such inclosures as are chiefly designed for the production of grass, ought to be smaller than those in which grain crops are intended to be raised. On light, sandy, or gravelly soils, the divisions should be small, in proportion to their dryness, and to the particular crops which can most advantageously and most commonly be grown upon them. On sheep downs inclosures are generally impracticable, and there shelter is only to be obtained from the standing fold; but on other lands of considerable elevation their extent should be reduced in proportion to their height, and the dryness of the grounds, the thickness of the hedges being likewise regulated by the same circumstances.

It has been ably remarked by a judicious writer, that "equal care should be taken to guard against the extremes of too much exposure, and that of creating a thick damp atmosphere, as the health, thrift, and beauty of animals are greatly promoted by proper shelter, and a due circulation of air. For instance," continues he, "a low, flat, and naturally damp situation, divided into small inclosures by high hedges and broad shaws, especially if they abound with trees, is totally unfit for the production of corn crops, and still more if it be exposed to a northern aspect, and inclosed with wood. In that case the sun is too much excluded, and the damp cannot be sufficiently drained and evaporated to prevent the redundancy of moisture from chilling the better plants, leaving an herbage that will be of no value to a farmer. On the contrary, if it be free from adjoining woods, be drained, and the ditches kept well cleansed, it would make good permanent pasture or meadow. If, also, the hedges be kept closely cut or clipt, the fields large, the trees trimmed to the height of twelve or fifteen feet, and every possible method taken to promote the free admission of the sun's rays, with a perfect drainage and evaporation, it would be fit for many of the purposes of aration."*

But though the stagnation of the air in confined situations may have an injurious effect on vegetable as well as animal life, by preventing the proper degree of evaporation from taking place; it is not less injurious to the feeding of animals than the growth of vegetables, when it circulates too much or too rapidly over a district, especially where the elevation is considerable, as in mountainous and hilly situations; for in such cases the warmth of the animals is too suddenly carried off by the too frequently renewed application of cold air, and the growth of the vegetable is also thereby much checked and retarded. In such situations, therefore, particular attention ought to be paid in planting the hedges so as best to break off the winds they would be the most exposed to. "It is as well," says the writer we have just quoted, "for the purpose of shelter, shade, and equable warmth, as of occasional fresh supplies of grass, that the Leicestershire graziers have founded their opinion, *that fifty acres in five inclosures are equal to sixty in one.*"

* Anderson's Essays, Vol. I. p. 158.

In laying out pastures then, the first step to be taken is, the division of the land into fields or inclosures, which may contain four, five, six, or more acres; but, in general, it may be remarked, that the larger or more extensive inclosures are less adapted for feeding, than fields of a moderate size: next, the whole ought to be fenced with good hedges, of such a height that cattle cannot easily overleap them, so that they can feed more leisurely, as well as more securely; and it is recommended to plant timber-trees at proper distances, in order to afford a shelter from tempestuous winds. But much caution is necessary, not to make the inclosure too small, especially when the hedgerows are to be planted with timber-trees; because the grass will become sour if these are disposed too closely together, and consequently will greatly injure the pasture. But whatever be the dimensions adopted for the inclosures, great attention should constantly be had to the convenience of water, the position of the ground, the purposes of drainage, and the bringing together, as much as is easily practicable, lands of a similar quality, or such as can be cultivated and sown under the same circumstances, though it may tend to render them unequal in regard to size, and irregular in form. Where, indeed, there are no circumstances arising from the nature of the situation that prevent their being formed in a regular manner, the size of the farms and the course of the crops that can be most beneficially cultivated on them should be principally regarded; as by their being thus made to suit the nature and extent of the farms, conveniences may be gained in the business of cultivating them, as well as in taking off their products, that no other mode of division could probably afford *.

With regard to the *shape* of fields, although this must be in some degree influenced by the hilly or level situation of the land, the position of roads, and many other localities; and although it is evident that, for ploughed ground, it is most advantageous to have the fences in strait lines; and that the fields, when large, should be square, and when small, of an oblong form, in order that the ploughing may be despatched with as few turnings as possible; yet, as the latter motive does not influence the laying out of pasture land, the material object should there be—shelter from the most prevalent and piercing winds.

* Robertson's View of the Agriculture of the county of Perth.

CHAPTER II.

ON FENCES.

FENCES, in rural economy, comprehend, in general, every sort of inclosure that is employed for shelter, or to protect the lands inclosed from the intrusions of cattle. They are of various sorts, and formed of various materials, according to the peculiar circumstances of situation and convenience, and may be classed under the heads of banks or walls, hedges, ditches, and gates.

I. *Earth banks* are chiefly employed in those districts where other materials for constructing fences are difficult to be procured. The best mode of forming such banks is, to dig up some turfs in a spot abounding with grass, about one spit deep, and four or five inches in thickness. These should be laid even on one side by a line, with the grass outwards; and on the back of these is to be placed another row of turf, leaving a space of one foot of solid ground on the outside, in order to prevent the bank from slipping or falling in, in case any part of it should be deficient. On the outside of this is to be excavated a ditch, otherwise it will be necessary to make both sides with a slope two feet deep; but this will not materially affect the fence, as both sides will produce pasture. The earth which is dug out of the ditches, or from the slopes, ought to be thrown in between the two rows of turf, till the whole is made level in the same manner, and the bank becomes four, five, or more feet in height, the width of the foundation being at the same time increased according to the width of the bank. In proportion as the bank ascends, the two sides must be made gradually to slope, so that the top shall be about two feet and a half wide. It should, however, be uniformly regarded, in forming earth-banks, that they never be constructed or raised in dry weather; for, in the event of sudden or long continued rains descending, the soil between the sods would swell and bulge out, and of course materially affect, if not totally destroy, the solidity as well as the symmetry of the banks. The top may be planted with quick, or any of the other shrubs useful for fencing, which will be stated in the course of this Chapter.

II. *Walls* are the most usual kind of fence in those districts which abound with stones; when well constructed, they are of great durability; and in all situations where stone can be obtained at a reasonable price, stone walls, though not so ornamental as hedges, are every way preferable in point of utility, because the benefit is immediate. The fossil used for this purpose may be lime-stone, rag-stone, or grit-stone, or any other kind that is most convenient; though lime and grit are preferable, on account of their being in greatest abundance, and most easily wrought. Walls are either made with stones only, in which case they are termed *dry stone walls;* or with stones and earth intermixed, when they are called *earth and stone walls;* or with lime and mortar, in which state they are denominated *lime and stone walls;* the last mentioned, though possibly more expensive in the first instance, are ultimately the most durable, and consequently the best adapted for fences.

In constructing stone walls, the foundation ought to be about two feet and a half in width, the wall tapering upwards to ten inches or a foot. The foundation should be placed at such a depth in the ground as to be totally unaffected by frosts; the wall should be carried up to the height of six feet, and coped at the top with stones placed edgeways; and where dung is laid against it, the height ought to be still greater, in order that the coping may be out of the reach of the stock. Where lime cannot be procured to cement the stones together, a dry wall may be constructed in the same manner, which, if judiciously arranged, will last nearly as long. As soon as the wall is completed, a ditch should be dug on each side, from eighteen to twenty-four inches in depth, at the distance of about one foot from the root or foundation of the wall, which will not only be thus kept dry, but will also contribute to the security and durability of the fence, by preventing cattle from approaching too near.

III. *Hedges* constitute another useful kind of fence, especially in those situations where no materials for walls can be obtained. They are usually formed by intertwining the branches of trees, and are commonly distinguished, into those intended for the protection and ornament of gardens; and, into *outward fences*, or hedges, which are employed for sheltering and de-

fending fields. In forming hedges of the last-mentioned description, in which we are chiefly interested, every attention should be given to have the plants as nearly as possible of the same size; although the nature of these will necessarily vary according to the quality of the soil. Thus, for wet or swampy places, that are liable to sudden inundations, the alder, willow, (or preferably to this the white-thorn,) and osier may be beneficially employed, and on dry, sandy situations *furze* may be made use of with great advantage, if it be planted at a proper time, and managed with care. For this purpose a bank should be raised, five or six feet broad at the top, with a proper ditch on each side, the surface of which is to be thickly sown with furze seeds. These will speedily vegetate, and in the course of two or three years will form a fence that will continue for several years, and resist the efforts of most animals. As, however, the furze increases in size, the old prickles will decay, and consequently leave the lower parts of the stems exposed, so as to afford an entrance to cattle; this inconvenience can only be remedied, or rather prevented, by gradually supplying the bank with new plants, which should not be permitted to shoot up to such a height as to leave the lower parts naked; thus, if one side of the hedge be cut down close to the bank, the other half will continue as a fence, till the former part attains a proper size, when the opposite side may be cut down in a similar manner; so that the bank will always have a strong hedge upon it, without being liable to become bare at the roots.

Among the plants which have been recommended for putting into hedges, are the following:—

1. The *black thorn*, the growth of which is less certain than that of the *white thorn*: though the bushes of the former are superior to those of the latter for mending dead hedges, being less liable to be cropped by cattle.

2. The *white thorn*, which grows very rapidly, is very durable, and will flourish in almost any situation, except gravelly soils: they are best calculated for this purpose when about one or two years old, and should be transplanted from a rich, fertile nursery. Thorn-hedges are unquestionably the best materials for this purpose, whenever the soil is suitable, or can be rendered fit for them.—And,

3. The *holly*, though slow and less certain in growth, is said

to be superior to either of the former plants for making quick-set hedges; and by its thickness and strength, fully compensates for the delay and expense incurred.

The best mode of making hedges with these trees is, first to mark out the line of ground, and, by ploughing or digging, prepare it for the purpose; the young plants, having been carefully removed so as not to hurt or injure their roots, are then to be placed in the ground, in proportion of four or five quick or white-thorns to one holly. Both will flourish; and, as the hollies increase in size, the thorns may be pulled up, and when the former have attained their full growth, they will occupy the whole space, and form a most permanent fence. Should any intervals occur, they may be easily filled up by bending down the lower branches, and covering them with earth; in the following year these will take root, and shoot forth so as to present an impenetrable barrier. It is well known, that white-thorns do not flourish to advantage on dry, gravelly, thin soils. The reasons assigned for this circumstance are, that they are set too low or too flat on the surface to allow the roots to strike deeply into the soil; and that, when planted higher, they are generally so near the slope of the bank, as not to receive any benefit from the rain. The remedy for these inconveniences is, to make out two lines, twelve feet asunder, and to take the upper part of the soil from three feet within each line, and to throw it into the centre of each space, so as to form a flat bed three feet broad; in the middle of this are the quicks to be planted, and the remaining space of one foot and a half is to be filled up with the earth or soil taken out of the ditches on both sides; so that the bed is extended to five feet, allowing six inches for the slope of the bank. Quicks thus planted will meet with sufficient nutriment in the soil, before the tap-roots reach the barren, gravelly bottom; and the earth thus placed will retain sufficient moisture to nourish the plants, which will in a short time form an excellent fence. By elevating the bank on each side, at pleasure, the thorns may be protected at a small expense from the ill effects of sharp winds, or sea air; and the benefit resulting from such kinds of hedges more than compensates the expense of making them*.

* See Transactions of the Society of Arts: communication from Mr. Leatham, Vol. III.

As thorn or quick-set hedges are not more admired for their beauty than their utility, the following account (communicated by an intelligent correspondent) of their culture and management, in Northamptonshire, may form a proper supplement to what has already been stated.

The largest haws being gathered in the autumn, from the finest and healthiest growing thorns, to the amount of one, two, or three bushels, according to the quantity which may be wanted, are first put in pits or holes, to clear them from the pulp, and in the spring are sown, not too thick, in beds, duly prepared as if for onions, about the breadth of asparagus beds, with paths between for convenience of weeding, &c. Sift over these a quantity of fine earth, sufficient to cover them equally about half an inch. Observe to keep them very free from weeds throughout the summer; and the next or following spring, according to their size, thin and transplant them into rows in narrow trenches across similar beds, the rows being about three or four inches distant, according to the strength of the plants, to remain till the following spring: keeping them clear of weeds in every stage is of the most essential importance; which not only expedites their growth, but prevents mildew (to which they are very liable in damp, foggy weather, and unfavourable seasons), that checks the circulation of the sap, and injures their progress. If the mildew affects them in the spring quarter, they will often revive at Midsummer; but afterwards, it commonly stops them for the rest of the year.

About the latter end of March, or early in April, which is the best season both for sowing the seeds, transplanting them in the beds, and removing them to their stations in the fields, draw out the best of the young plants, from one-eighth to one-fourth of an inch in thickness, which will sooner take root than larger ones, and form them into bundles of 1000 each, the ground being first prepared for planting them, by cutting out a small trench, not deeper than the good soil, on each side of the proposed fence-row, and throwing it over the turf, on which the plants are to be deposited. Hollow it out in the form of a bason or punch-bowl, in the outer side of which the plants are fixed, which should be rather higher than the inner side; first sloping off by a line of equal height from the bottom of the hollow, in the fresh earth which is thrown up, to form a bed for the plants. Having first cut off the small end of the plants, so

as to leave only two or three buds above ground, when planted, or at the utmost above three inches, cut off also as much of the root end as to have only about four or five inches in the ground, when covered with earth, taking care to leave on some of the tender fibres of the root, slightly trimming the fine ends with a sharp knife. These may be placed about three inches asunder, a little more or less, according to the strength of the plants, so that 12 of these will extend a yard, and 264 a chain, or, what they call for that purpose only, an acre. Having covered a sufficient length of these, and the side inclining as before, another line is to be sloped off, about three or four inches above the other; in which another row of plants is to be deposited in the same way, and at the same distances, and covered with earth as before, care being taken to place each plant in this upper row against the intervening spaces of the plants in the lower row. This row will, therefore, contain as many plants as the other; and both of them about 528 plants in a chain of 22 yards in length. Then finish off the inclination of the sides, with a small flat or hollow on the top above the upper row, and so proceed until the whole is finished. The sooner the plants are thus deposited in their new situations, after removing from the seed-beds or nursery-beds, the better; but especially, be careful to put them in speedily after cutting and trimming, before the sap dries up; and no time should be lost in laying them in their places, whilst the natural moisture continues in the soil from the trenches, both for bedding and covering them. On these minute attentions, especially if the spring should be afterwards dry for some weeks, their taking root greatly depends, as must be obvious to common sense.

The hollow or bason form of managing the ground for planting the sets is an essential consideration, though in many other counties greatly neglected. If the weather should prove dry, it serves as a reservoir for collecting at least every particle of moisture which falls in the space between its extreme edges, whether by dews or partial showers; which serves to feed the roots of the plants, which are just above it and will soon strike down towards it, and also prevents weeds, when duly attended to, from injuring the roots and robbing them of their nourishment. In the growth of these plants, therefore, the weeds, which will naturally push forward, must be kept under by hand-

hoeing and weeding, both above and below the rows of plants, as well as between them; which will also have the effect of fitting the soil to receive the full benefit of the night dews, &c. This hoeing and weeding was constantly performed four times every summer, for each of which the labourers were then paid sixpence a chain of *22* yards. Early in the spring, before the hay-harvest, and before and after the corn-harvest, were the usual seasons of performing these operations.

But all this trouble and expense and precaution would be of little use, if no care were taken to preserve these fences from injury. It was usual, therefore, (and no doubt is still practised, being a woody country,) to provide rough posts for each side of the bank, at distances estimated by the length of rails, three of which are kept together by mortises in the posts; thus forming a secure fence against great cattle, the posts being placed at such a distance on each side from the plantations, that the cattle cannot put their necks over to crop them; and when sheep or lambs are put in the ground to feed, furze or loose thorns are drawn into the rails, to prevent them being damaged.

Where any plants have accidentally failed, they are replaced on the first Spring hoeing regularly by fresh sets. In two years commonly, or three years at most, where this care is taken, and the soil is not very stiff and barren, the plants will have gained sufficient strength to be cut down to about seven or eight inches high; which will cause them to shoot out very strong and thick, so that in two or three years more they will become a fence sufficient for any moderate purposes, and with a little longer care will be competent for every necessary defence. Before this time, the posts will begin to decay at the feet, and must be occasionally repaired and guarded; but common attention will always obviate any serious injury, and need not be an object for particular direction.

A practice of a less minute and circumstantial nature, prevailed some time since in the adjoining county of Bedford, where less attention was paid to the articles of hoeing and weeding; and the consequence was, that fences which had been planted ten years, and attended with the expense of two sets of posts and rails, were in a less promising state than those above noticed, though within a few miles, were in three years. Indeed it was doubted at that time, whether those alluded to in

Bedfordshire could ever make a fence; and whether they must not be planted wholly anew, and a similar management pursued to what has been stated. In some part of Wiltshire also, especially on the western limits, towards Somersetshire, an absurd mode of planting, as well as a carelessness and inattention afterwards, strongly prevails; where secondary plantations have actually been made in single rows, but without any of the precautions above mentioned, and if no guard or preservatives be provided beyond mere temporary expedients, these will succeed no better than the former. Where ornamental hedges are intended to be cut, three rows of plants will be necessary in the same quincunx order as above.

In addition to the plants which have been recommended for constructing fences, may be noticed the *horn-beam* tree, which is chiefly used on the continent; it is propagated from slips or sets, and will thrive admirably well on poor, barren, and exposed lands. The slips, or layers, are planted on an earthen parapet, with a ditch on each side, in such manner that every two plants may intersect each other; the bark is then scraped off the spot where they meet, which is covered with bands of straw: thus the two plants become united, and put out horizontal, slanting shoots, forming a very strong palisade, which, if carefully lopped or shorn every year, will render the whole hedge utterly impenetrable to men and animals. The *elm* has likewise been brought forward to public notice, as being calculated for fences. When elm timber is felled in the spring, the chips made in trimming the trees are to be sown on a piece of newly-ploughed land, and harrowed in. Every chip which has an eye or bud will speedily shoot, like the cuttings of potatoes; and as elms have no tap-roots, but strike their fibres *horizontally* in the soil, they will be more vigorous, and may be more easily transplanted than if they had been raised from seeds. Another advantage stated to result from this method is, that the same chip or bud will produce five or six stems; and, after being cut down to within three or four inches of the ground, the lateral or side shoots will proportionably increase, and form a thick hedge, without running to wood; and if they are carefully clipped every third or fourth year, they are said to become almost impervious to any cattle whatever *.

* Letters and Papers of the Bath and West of England Society, Vol. I.

Privet, when planted with the hawthorn, makes a good close hedge, if it be well kept. It is a well known and beautiful shrub, flowering in June and July, and preserving its verdure almost throughout the year: it scarcely sheds its leaves till March, which re-appear in the following month. It delights in pretty dry and friable soils, and puts forth many trailing branches, which take root when they come in contact with the earth, and its cuttings grow very freely.

In addition to these, we may also mention the *American cockspur thorn*, (*cratægus crus galli*, L.) We doubt not but it will be familiarized to our climate; and, in this hope, subjoin the following account of it, by an intelligent American farmer, who has been most successful in rearing this plant*. It grows to the height of ten or twelve feet, and has a strong stem: its bluish red flowers, which blow in June, are in roundish clusters; and its haws or fruit are of a globular form, having a fine red colour. Mr. Neill's instructions for cultivating this beautiful and valuable shrub are as follow:—

"First lay down stone convenient to the spot where you intend your fence, say one cart load of middle-sized stone to 15 feet;—then run your line where you design the front of your bank, and close to that line lay one row of stone compactly together; then move your line twelve inches out, towards where you design to dig your ditch: the last twelve inches remain in front of your bank, to keep the frost from working under, till the roots grow through to bind the earth together, which they will do in three years. With a spade cut along your line the depth of a good sod, keeping the face of your spade always in towards your ditch: then lift your line, and lay it four feet apart from the last, and cut with the spade as before; then sod off the four feet between the last two lines, and throw it back behind your row of stone. Let the mother earth on your sod be mashed fine with the spade, and drawn in with the hand carefully to and over the stone to the depth of two or three inches; then lay your thorns in an horizontal direction, the top rather inclining upwards, at six inches apart. Advancing two or three inches through the stone, carefully drawing the nicest mother earth with the hand over the root; the next row is of middle-sized stone, (but be as

* Mr. Neill, of Delaware County, Pennsylvania. Transactions of the Philadelphia Agricultural Society, Vol. III. pp. 11 and following.

careful as possible not to pinch your plant between flat broad stones,) and go on with row of stone and layer of earth until your bank is three feet six inches high, your ditch three feet deep, carried down so as to meet at two feet at bottom: in raising the wall in front of your bank, carry it up almost plumb, for, as your earth settles down, your wall will lean back and become too shelving."

Mr. Neill trims his hedges either in the spring or fall, but not at both seasons, as the growth is injured by much trimming. Many are the advantages derived from his method of rearing the cockspur thorns. Besides the farmer receiving immediate benefit from it, when first made, hedges made of these thorns are more easily kept clear of weeds: the weight of the bank keeps a moisture about the ground: they stand dry seasons better, grow more quickly, and are not half so liable to die, as when planted in the other common way. The banks are in no danger of being undermined by frosts after a year or two, nor indeed are they in much danger from these at any time. Good ground always produces the best hedge if managed properly: and though Mr. Neill had but very poor soil, which was also high and dry, yet by manuring it, accompanied by diligent attention, he has thorns of four successive years planting, perhaps not excelled in any country. The cockspur thorns, however, must be kept as much as possible from the shade of trees.

Beech and *birch trees* are said to form, with proper care and attention, excellent fences, and in a short space of time, in very elevated and exposed lands; it has also been suggested, that great advantage may be derived by planting cider fruit-trees, as the profit they then would yield, would amply counterbalance the expense incurred in rearing them, without losing any ground, as the uncommon acidity of the best fruit, at the time of gathering, will effectually secure them from depredations.

The proper season for hedging is in the autumnal quarter, whence it may be continued through the winter, as opportunity may allow, or circumstances may require. Mr. Young very judiciously advises the farmer to get his fences into good order during the three first winters of his lease; and afterwards to divide them into equal portions, one of which may be done every year, which will bring the whole into regular cuttings. It is, however, an erroneous, though common practice, to cut thorn hedges every year: for, though it confessedly promotes

the *beauty* of the fence as it respects *appearance*, yet this beauty is attained at the expense of strength and durability; inasmuch as the stems are impeded in their growth, and become small and weak. On the contrary, if they be carefully lopped or clipped every seventh or eighth year, with a sharp pair of shears, *in a sloping direction on both sides, from the bottom to the top*, there will not only be a very material diminution in the labour, but the hedges will also become more close and vigorous, and will, in succeeding years, only require the most prurient lateral branches to be shorn off in the manner above directed. The proper season for this purpose is in the autumn, when the circulation of the sap is less vigorous, and consequently the plants will not suffer materially from its loss.

The growth and durability of quickset-hedges may be materially promoted by *plashing* them; an operation which is performed in the following manner:—In the first place, the labourers clear the old hedge of all dead or decayed wood, brambles, and other irregular growing rubbish; leaving along the top of the bank the best and straightest stem of elm, thorns, beech, &c. in the ratio of five or six to one yard; though if there be any *gaps*, or spots, which are thin of live wood, a larger number is left on each side of such spots. Next they repair the ditch; all the earth arising from which must be thrown on the *bank*, and by no means laid on the brow of the ditch, unless the ditch-earth happen to be extraordinarily rich, and will pay well for the expense of carrying it to the land; otherwise the grass of the border will be spoiled, and an unnecessary charge be incurred. The ditch being thus completed, the men commence their labours upon the hedge. Such of the stems left in cutting the old hedge, as they find growing in the line where the new hedge is to run, they cut off three feet from the top of the bank, in order to serve as hedge-stakes to the new hedge; a practice which cannot be too much commended, for these stakes being immoveable, and never rotting, keep up the new hedge; so that it never falls or leans either way. In the next place, they drive in dead hedge-stakes where it is necessary, choosing sallows or willows, that they may grow. The hedgers then plash down the remainder of the live wood left standing: they cut the stick twice, once near the ground, and again about ten or twelve inches higher, and just deep enough to slit out part of the wood between the two; leaving the stem supported by little more than

the bank, or about a quarter of its first size. It is then laid along the top of the bank, and woven among the hedge-stakes. In this manner the whole are treated; and where the plants are not sufficiently thick to finish the hedge, dead thorns are interwoven, and the top of the hedge is *eddered* in the common method.

The business of *plashing hedges* is sometimes performed in October, but more generally towards the end of January, in February, or in March. This latter season is the most advantageous, as the plants, which have been divided or cut during the operation, will be less susceptible of injury from the vernal frosts.

The fence thus made consists of a good ditch, and of a hedge, of which the principal parts are alive—a point of the greatest importance, as such management insures a lasting fence; whereas hedges, that are entirely dead, rot in a short time, and fall into the ditch.

IV. *Ditches* are cut with various intentions; either to serve as drains, or for fences, or alike for both purposes. Ditches are generally allowed six feet in width, where they are at the side of highways, and five feet in commons. Those which are made or repaired at the feet of banks on which quick-set hedges are raised, should be in no case less than three feet by two and a half, and nine inches wide at bottom, in the driest soils; but in all wet or moist ones, never less than four by three, and one at bottom. Thus each side acquires a slope, which is of great advantage, and indispensably necessary; for, when ditches are cut perpendicularly, the sides are continually washing down. Whatever be their purpose, whether for drainage or for fencing, ditches ought to be so constructed, that the water they contain may never become stagnant, but pass off into a contiguous rivulet, or brook: they should likewise be occasionally cleaned out, and the mud thus obtained will defray the expense of the additional labour; as it will, when mixed with other matters, form a useful compost for manuring lands.

V. *Gates* are of various forms and denominations, according to the manner and materials of which they are made. The wood usually employed for this purpose is oak, ash, beech, and other solid timber; though the Dutch willow, and some lighter kinds of wood, may be beneficially converted to the same purpose. In constructing gates, the chief points to be attended to

are, the *fixing* of the post so as to resist the attacks that are often made by the forcible swinging of the gate, and the *hanging* of the gate itself, so that it may shut easily and truly, without dragging on the ground.

With regard to the gate-post, where timber is used, it ought to be either prepared by tar, pitch, or oil-paint, in that part which is intended to be deposited (and such posts should always be fixed firmly and deeply) in the earth, or by charring: and all that is above ground, exposed to the air, should be covered with one or two coatings of oil-paint, which will be attended with comparatively little expense, while the advantage thence derived, in point of durability, will be very considerable. Gate-posts will also be more durable if their *natural position be reversed*, that is, if the top be put down into the soil, and that part which was nearest to the root be placed out of the ground. No reason has hitherto been assigned to account for this very important fact, which cannot be too extensively known where timber is used for gate-posts. Stone gate-posts, however, are preferable, where they can be conveniently made.

For convenience, in point of size, and security to the farmer, *five-barred gates*, properly braced, are perhaps preferable to any others. The dimensions of such a gate should be from eight to eight and a half, or nine feet, in width or length, and from four to four and a half, or five feet high; the bars should be strong, and three inches and a half deep, and the lower ones so arranged as to prevent small cattle from squeezing through them into the field. The common gates are usually hung on hooks and thimbles, and fastened with latches or catches, without regarding the adjustment or proportions of the whole, with regard to their tendency or difficulty in shutting. With a view to remedy this inconvenience, it has been suggested, to make the lower hinge circular, to move in a groove of the post, instead of having two forks to fall on bars driven into the post. By this contrivance it will be impossible for swine or other cattle to throw the gate off, by creeping under it. With the same view it has also been recommended in the "Agricultural Survey of the County of Northumberland", after perpendicularly fixing the hanging post on the ground, to draw a plumb-line upon it. On this line, at a suitable height from the top, is to be placed a hook, so as to project three inches and a half; and, at a proper distance below this, another hook is to be put, one inch and a

half to one side of the perpendicular line, and so as to project two inches from the face of the post. The top loop, or eye, is next to be placed two inches from the *haw-tree*, and the bottom loop three inches and a half from it. Gates hung upon this principle are said to possess a sufficient fall, in every situation, and will shut without any difficulty.

CHAPTER III.

ON PASTURE LAND.

The nature and excellence of pastures depend greatly upon situation, and the different classes of animals for whose use they are intended. Thus *uplands*, or such lands as are considerably elevated and dry, will be found most beneficial for feeding sheep; while neat cattle may be fattened to the greatest advantage in those which are lower in point of situation, as well as more inclosed. Further, it has been found that the older pastures are best calculated for feeding or fattening-stock, while *new lays* (that is, such as have not long been laid down for pasture) are more fitted for feeding young store cattle; and that the size or extent of the inclosure likewise influences the application of pastures.

Pastures, like other grass-lands, are liable to be infested with *weeds*, as well as with *ant-hills*, mole-hills, and other obstructions to the plough and scythe; the former ought to be carefully eradicated towards the end of summer, before the seed-lobes are formed; and, when sufficiently dry, they may be burnt, and their ashes spread on the land previously to the falling of autumnal showers. All mole and ant-hills should be either pared off with the plough and burnt, and their ashes spread on the earth; or otherwise destroyed in the manner already mentioned *.

* Concerning the destruction of ant and mole-hills, see Ch. VIII.

Nothing improves pasture land more than a judicious top-dressing; although, it must be observed, little comparative regard is, in general, bestowed on this subject. Thus, if the land has not been limed, a good liming, either of that fossil in its natural state, or in the form of a compost, will be found of very great service; marl, or well-rotted dung, may be spread in like manner, regularly over the soil *. The folding of sheep on pastures, while they are fed or fattened with other succulent food, will prove of essential advantage; because the dung thus dropped will be both richer in point of quality, and more in point of quantity, than it could possibly be, if they were fed or pastured on grass alone, without the aid of any other food. At the same time the sheep will contribute partially to check the too luxuriant growth of the grass, which will consequently unite at the bottom, and thus produce a sweet and tender herbage.

As the choice of seeds proper for laying down pastures will be stated, and the best sorts, together with their culture, will be pointed out in a subsequent chapter on the culture of grass land; and as, we trust, an accurate view of the comparative advantages capable of being derived from the hard or light stocking of pastures has been already taken †, we proceed to consider the proper time for turning cattle into pastures.

In addition then to the intimations on this subject, which have been already given, we would observe, that from the latter part of March to the close of April, or early in May, will, in the warmer districts of the southern counties, be found most beneficial, in proportion as the season is more or less backward; but in such as have a more northerly situation the turning of cattle into the pasture may be delayed for one or two weeks, or even longer, with considerable advantage. The result of this practice is, that the cattle will eat off the central stems of the grass-plants, in consequence of which, new leaves are produced around the first joint of the stem thus grazed; and, as this management is equally applicable to meadows, a more abundant crop of hay will be produced.

Grass-lands may be much improved both in the quality and amount of the herbage, by cutting them three or four inches deep, with either a fine coulter-cutting plough, or with the com-

* See Book X. Chap. I.

† See Book I. Chap. VIII.

mon scarifier, already described *; which cuts the surface in slips of a few inches asunder, but without either rasing or turning them. Manure being at the same time laid upon the land, is carried down by these incisions to the roots of the plants, and thus supplies them with immediate nourishment. But it is not merely in this application of the manure that the advantage consists:—it loosens moss-bound sward; and, by dividing the roots of the grass, it occasions them to throw out new shoots, by which the herbage is not alone increased, but rendered more succulent and palatable to cattle. It is perhaps one of the most valuable means of improving exhausted pasture land without breaking it up. The operation should be performed early in the spring, and in the following manner:—

The grass having been previously close-fed, the shares of the scarifier should be set at such a distance apart as the state of the land may appear to require—the more dressing it requires, the closer they should be placed;—the field should then be cut lengthways, and, if very poor, also across, so that the sward may be divided into squares: such grass seeds as are most appropriate to the soil should then be scattered over while the incisions are fresh; the top-dressing should be applied, and the field should be well bush-harrowed and rolled. If sheep were afterwards folded on it, the improvement would be complete.

Bush-harrowing and rolling should not, indeed, in any case, be ever omitted in the spring; and it is at all times useful after cattle have been removed: the former spreads the manure; and the latter, by compressing the roots of the grass, occasions it to acquire a thicker bottom.

Close-cropping young grasses has, however, been found prejudicial early in the spring and late in the autumn. A writer of the first authority on this subject, remarks †:—"That where a given space of the same species of grass was cut close to the roots towards the end of March, and another space left uncropped till the last week in April, the produce of each space being afterwards taken at three different cuttings, the produce of the space that was left uncut till the latter end of April exceeded that of the early cropped space in the proportion of 3 to 2; and in one instance, during a dry summer, the last cropped space

* See Book VII. Chap. VII.

† Sinclair's *Hortus Gram. Woburn.* p. 389, Third 8vo. Edition.

afforded a produce superior to that of the early cropped space as 2 to 1." Depasturing the first year is also prejudicial; for though sheep have been considered useful, and are so to old sward, yet they crop the seedling plants too closely. A better plan is to roll frequently and mow; but as the young plants would thus be deprived of the benefit of the dung, a good top-dressing should be supplied, and with it another portion of seeds should also be sown, and the whole be rolled closely down to the roots of the plants.

A peculiar, but excellent mode of improving poor or indifferent pastures is practised in Yorkshire, and also in the county of Cardigan, which merits the attention of the intelligent agriculturist. The farmers in those districts put up their pastures as soon as they can in May, for the summer season; and during that period no other attention is given, than to remove all noxious weeds. Thus the lands remain unoccupied till December, when the grazing stock are turned in, and every animal is stated to become in excellent condition without the aid of hay, straw, or oats. The winter frost sweetens the grass which continues uninjured by the snow; but, while the ground is covered with the latter, dry food ought to be given to the cattle. In the ensuing spring, young shoots of sweet grass will spring forth from beneath the shelter of the old grass plants, and both will be eagerly eaten; while, throughout those two seasons, the milk and butter will, it is said, prove in every respect equal to that which may be made at any other period in the year. The advantage of this practice is obvious on lands that have become infested or overrun with moss in consequence of hard stocking, or being grazed too bare; as such pastures will be shortly covered with sweet herbage, and the moss will disappear without requiring the assistance of the plough, or of any surface manure or top-dressing.

CHAPTER IV.

ON MEADOWS.

UNDER this head are included those grass-lands which, lying for the most part in low or moist situations, are reserved chiefly

for the making of hay. It has been justly observed by an intelligent cultivator *, that the great difficulty is to discriminate what species of land is fit for grass, and what is not. The best meadow-land does not always make the best tillage-land; nor does the best arable produce the best pasture, but frequently the reverse.

The lands which are most proper to remain in grass, and which, if in a state of aration, ought to be converted into meadow, are the following, viz.

1. Lands in the vicinity of large and populous towns, where manure is cheap and plentiful, and where the produce of grass-land is always in demand, and consequently dear.
2. Lands situate near rivers or brooks, which are capable of being improved, by irrigation, to a much greater value than can possibly be effected under any other mode of culture.
3. Lands lying in the valleys of mountainous countries, particularly calcareous soils; where old meadow-land is scarce and valuable; and where the greater part of the arable land is of such a nature, that it is almost impossible to convert it into good grass-land.
4. All cold, strong, grass-lands, which, if ploughed up, would be inapplicable to the growth of turnips, and to the general purposes of modern husbandry; and which, under the best system of wheat husbandry, would not be so valuable as they are now in a state of grass. An exception, however, occurs, with regard to land of this description; for, where sea-sand can be applied, at an easy expense, as a manure, such land may be more profitably employed in tillage.
5. *Peaty soils* are also best adapted to the purpose of yielding grass; for, though they may be most perfectly reclaimed from producing rank aquatic plants by tillage, yet, being too tender and too moist to continue long in a state of aration, they should be converted to the state of permanent grass-land as soon as that object is accomplished †.

* Mr. Davis, in Communications to the Board of Agriculture, Vol. III. p. 80.

† Communications to the Board of Agriculture, Vol. III. pp. 79, 80, &c.

It ought to be observed, that land intended for grass ought to be that in which it will spontaneously thrive and flourish; consequently, if there be too much moisture, the grass will be injured in the winter by rain and frost, and will soon be superseded by rushes, and other aquatic plants. On the other hand, if the land be too dry, the grasses will be killed by the intense heat of summer, and be succeeded by mosses, fern, heath, &c.

No land will make a good meadow unless it be sufficiently deep to admit the roots of grasses to run down out of the reach of the summer heat, and also sufficiently retentive to hold water long enough to produce fermentation, together with such an absorbent substratum as will drain it before putrefaction takes place; and, if it be not so by nature, it must be rendered so by art. On the contrary, if land be too dry and friable, ploughing will only render it more so. Grass-land of this description, therefore, Mr. Davis observes, ought never to be ploughed, unless it can be made retentive by the application of lime, clay, chalk, or other fossil manures that can be procured on or near the spot, especially marl. Where either of these can be obtained at a moderate expense, and where good crops of grain have not only been produced, but also a tendency is promoted in the land to run again to grass—land of this description, that can be so managed, should be ploughed up, and after being a few years in tillage, but particular care being taken not to exhaust it by corn-crops, may be again laid down to grass in a much better state than it originally was.

Beside these various considerations, there are other circumstances of very material moment in the laying down of lands for meadow; which, however, have not (at least till within a few years) been regarded with that attention which their importance requires. In fact, whoever examines the composition even of our best pastures, will find them to consist of a mixture of plants, altogether dissimilar in their nature and properties; and that, with the exception of such as have recently been laid down with rye-grass or clover, they will prove, as a late eminent and amiable botanist * has justly pronounced them, to be "pretty much in a state of nature; full

* Mr. Curtis, in his Flora Londinensis. The same remark occurs in his Practical Observations on British Grasses, 8vo. See also Sinclair's Hortus Gramineus Woburnensis.

of an indiscriminate mixture of plants, some of which afford good, others bad food; some good crops, others scarce any crops at all."

The following principles, or requisites, will be found worthy of every person's notice, who designs to lay down land for a state of grass:—

1. A perfect acquaintance with the best *natural grasses*, their *peculiar soils*, and the best mode of collecting or procuring their seeds.
2. Attention to an *early growth* is of equal moment; especially as, from a variety of unforeseen accidents, the most careful and intelligent farmer may not have a stock of food adequate to the consumption of his cattle. The seasons, indeed, must ever produce great changes with regard to the forwardness of grasses, and the reverse; and hence the necessity of having warmly situated and not too humid inclosures, of a moderate size and well sheltered, will be more clearly obvious; because, in this case, the ill effects resulting from severe winters, or from the prevalence of north-easterly winds during the spring, in keeping the herbage backward, will be counteracted as much as is possible for man to counteract them. In fact, the early grasses appear to be most coveted by cattle, which of course will thrive best on what is most agreeable to their palate; so that an early bite, an early hay-making and hay-harvest, and consequently the early use of the after-grass, or rowen, are important objects to the farmer*.
3. An acquaintance with the *peculiar soils*, and relative hardiness of grasses, is another requisite, without which no good meadow can be formed, and which can only be derived from actual experiment. Thus some are less able to endure moisture than others, and of course flourish most in the *drier* situations; while others are totally unfit for dry soils, but vegetate luxuriantly in *moist* lands; and others again are only fit for the most *barren* lands, which are unfit to rear any other kinds of grass. Of the *first* description are the smooth-stalked poa, or smooth-stalked meadow-grass, saintfoin, &c.: of the *second* are the rough-

* Mr. Tollet, in Communications to the Board of Agriculture, Vol. III. p. 427.

stalked poa or meadow-grass, the flote-foxtail and flote-fescue, water-poa or meadow-grass, &c.; and to the *third* belong the sheep's fescue, hard fescue, &c. &c. There are likewise numerous grasses which delight in almost any soils, except the extremes of wet and dry, which it will be unnecessary here to specify, as they will be detailed in a subsequent chapter.

4. With regard to the procuring of good seed, considerable difficulty has prevailed, from the fraud practised by mercenary individuals, who often mix seeds of nearly the same size, in order to save time and trouble in separating them. Speaking of *separated grass-seeds*, Mr. Young observes, that he cannot advise a young farmer to pay much attention to this object, unless he proceeds on very sure grounds, by forming a contract for the sale of the seeds at a good price, before he commences his operations. This method he has resorted to, and has found it cheaper to procure the seeds, by having them gathered by women and children, by hand, than to raise them himself, under the determination to have them perfectly free from all mixture. He states*, that he has had large quantities of cock's-foot and tall oat-grass gathered at four shillings per bushel, and the crested dog's-tail at a shilling a pound; and has thus laid down many scores of acres, having found them cheaper at these prices than when they were raised in drills with great attention†. Where, however, a farmer is desirous of obtaining pure seed for his pastures and meadows, and can command the necessary time for raising a supply of seed for future use, he may profitably avail himself of the following directions, given for this purpose by the late Mr. Curtis‡.

* Farm. Cal. p. 242.

† As, however, it may sometimes happen, that a young farmer may not be able to procure seeds in this way, and consequently is reduced to the necessity of purchasing seeds from the shops; we cannot, on the present occasion, in justice, omit to mention Messrs. Gibbs and Co. seedsmen to the Board of Agriculture, and Messrs. Cormack and Sinclair, of New Cross, near Deptford; whose indefatigable efforts to procure the best seeds of every description, are, in every respect, worthy of the patronage they have obtained. See Appendix, No. 11.

‡ Practical Observations on the British Grasses, p. 31.

"If a piece of ground can be had, that is neither very moist nor very dry, it will answer for several sorts of seeds; they may then be sown on one spot; but if such a piece cannot be obtained, they must be sown on separate spots, according to their respective qualities, no matter whether in a garden, a nursery, or a field, provided it be well secured and clean. Dig up the ground, level and rake it, then sow each kind of seed thinly in a separate row, each row about a foot apart, and cover them over lightly with the earth: the latter end of August or beginning of September will be the most proper time for this business. If the weather be not uncommonly dry, the seeds will quickly vegetate, and the only attention they will require will be to be carefully weeded. In about a fortnight from their coming up, such of the plants as grow thickly together may be thinned, and those which are taken up transplanted, so as to make more rows of the same grass.

"If the winter should be very severe, though natives, as seedlings, they may receive injury; therefore it will not be amiss to protect them with mats, fern, or by some other contrivance.

"Advantage should be taken of the first dry weather in the spring, to roll or tread them down, in order to fasten their roots in the earth, which the frost generally loosens: care must still be taken to keep them perfectly clear from weeds. As the spring advances, many of them will throw up their flowering stems, and some of them will continue to do so all the summer. As the seed in each spike or panicle ripens, it must be very carefully gathered, and sown in the autumn, at which time the roots of the original plants, which will now bear separating, should be divided and transplanted, so as to form more rows; the roots of the smooth-stalked meadow-grass, in particular, creeping like couch-grass, may readily be increased in this way; and thus, by degrees, a large plantation of these grasses may be formed, and much seed collected."

In laying down lands to grass, the most important primary object is duly to prepare them for the reception of the seed. Hence the soil ought previously to be brought into the highest possible degree of fertility; for, though land may be too rich for the production of corn, and of such crops as are cultivated

for the seed, it is quite otherwise in the case of grass or other crops, where the object in view is the largeness and luxuriancy of the plants themselves, as it is in the cultivation of all plants intended for *feeding cattle*. In such case, indeed, the richness of the soil is a most important consideration; because, the richer it is made, the more abundant crops will it produce, and consequently will support a larger stock of cattle; whereas effects directly contrary must result from laying down to grass poor land, or such as has been impoverished by successive exhausting crops. Further, on account of the minuteness of the seeds, and the (generally) fibrous nature of the roots of grass-plants, it is essentially requisite to the formation of a good meadow, that the ground be previously brought into the highest possible degree of pulverization; otherwise the irregularity of the surface will not only occasion an irregularity in the produce of grass, but this will be liable to be materially damaged by excessive droughts before it can have extended its roots, or become firmly settled in the land. This preparatory pulverization of grass-land may be effected in various ways, according to the nature of the different soils. Thus, in light soils, frequent ploughing and harrowing, together with the previous rearing of turnips, potatoes, tares, and other fallow crops, which, by the shade they afford, as well as the culture they require during their growth, are calculated to reduce the soil into a friable state. Mr. Young is of opinion, that the preparation of land for grass either by a fallow or by winter tares sown very early, and mown in June for soiling, (which will give nearly two months in the very heat of summer for tillage), is one of the most effective for cleaning land that can be adopted. In a communication to the intelligent author of the Agricultural Survey of the county of Durham, Sir John Eden states that, "from repeated experience, he is fully satisfied that the best mode of laying down land to permanent grass, is by early ploughing in autumn, and cleaning the next summer, and then to sow with new hay-seeds, white clover, and rib-grass, about the latter end of July." He tried this upwards of fifty years since, and practised it ever since with success*.

Heavy and stiff soils may be prepared for grass crops by repeated ploughing before winter, and leaving them exposed to

* Bailey's Report of Durham, p. 181.

the action of the frost during that season, together with frequent harrowing, and sometimes rolling in the ensuing spring; and likewise the introduction of cabbage, clover, rape, beans, or other vegetable crops, which have a power, in consequence of the peculiar formation of their roots, to loosen such compact soils, and reduce them into a fine condition. Besides, all obstruction to the scythe, such as ant-hills, mole-hills, &c., should be carefully removed, and the land manured, the proper season for which purpose is in February, and again after the grass has been mown; but, if the application of manure to grass-lands be omitted after mowing, it ought on no account whatever to be deferred later than October.

A plan has been introduced, within these few years, of laying down land to meadow by transplanting part of the sward of old grass-land. The operation is performed by cutting stripes of grass, in the same manner as sods are usually cut for lawns, and laying them down at certain distances from each other, whence they will afterwards spread their roots and become one connected mass; and the advantage consists in thus converting one acre into many, of old grass, of which these transplantations possess all the most valuable properties. The idea is ingenious, and merits further attention; but, hitherto, it has not been attended with all the success that was anticipated; and land newly laid down, under a proper system, has been found to produce a heavier burthen of hay within an equal time and at less expense.

CHAPTER V.

ON THE CULTURE OF GRASS-LAND.

THE quality of the land intended to be laid down to grass having been ascertained, it then becomes important to select those plants which are most congenial to the soil, and to sow their seeds in such proportions as may be most likely to produce a close sward and succulent pasture, with which view the

Rev. Arthur Young, son of the veteran agriculturist whose labours are so often noticed in this work, recommends that they should be varied according to the following table :—

CLAY.	LOAM.	SAND.	CHALK.	PEAT.
Cow grass	Wh. Clover	Wh. Clover	Yarrow	Wh. Clover
Cock's-foot	Ray, or Rye-grass	Ray	Burnet	Dog's-tail
Dog's-tail	Yorksh. Wh.	Yorksh. Wh.	Trefoil	Cock's-foot
Fescue	Fescue	Yarrow	Wh. Clover	Rib
Oat-grass	Fox-tail	Burnet	Saintfoin	Yorksh. Wh.
Trefoil	Dog's-tail	Trefoil		Ray
Yorksh. Wh.	Poa	Rib		Fox-tail
Timothy	Timothy			Fescue
	Yarrow			Timothy
	Lucerne			

In regard to the quantity per acre of these plants, Mr. Y. remarks, that the proportion must necessarily depend on the means of procuring them. In situations where women and children are fully occupied, it may be difficult to obtain large quantities gathered by hand; and, in such cases, the farmer must be content with what can be purchased. The crested dog's-tail, indeed, may be so generally procured in this way, that he cannot but suppose it to be in a good measure at command *. Without adverting to this point, however, he thinks that, from the lands which he has laid down to grass to a considerable extent, and in which he has largely used every one of the plants above enumerated, except the poa, or meadow-grass, the following quantities may be safely recommended. These proportions are also recommended by other eminent culivators, whose names will be duly specified.

I. CLAY.

SEEDS.	SUBSTITUTES.
Cow-grass.....5 lbs.	Yorkshire white.....2 bush.
Trefoil .....5 lbs.	Timothy .....4 lbs.
Dog's-tail.....10 lbs.	Ditto 4 lbs. or Yorkshire white 1 bush. †
Fescue, Fox-tail } ..... 1 bush.	

* Farmer's Calendar, p. 448.

† Communications to the Board of Agriculture, Vol. III. p. 150.

II. LOAM.

SEEDS.		SUBSTITUTES.	
White Clover	5 lbs.	Ray	1 peck.
Dog's-tail	10 lbs.	Rib grass	4 lbs.
Ray	1 peck.		
Fescue	3 pecks	Yorkshire white	2 pecks.
Fox-tail	3 ditto.	Timothy	4 lbs.
Yarrow	2 ditto.	Cow-grass	5 lbs.

On loams, that are on a substratum of *stone-brash*, (of which description are almost the whole of the Cotswold-Hills, and great part of the counties of Gloucester, Somerset, Warwick, and Wilts,) Mr. Davis * recommends the following quantities to be sown per acre, after marling in July; viz.

Ray-grass.....1 bushel.
Marl, or cow-grass.....10 lbs.
White, or Dutch clover....3 lbs.
Trefoil, or hop-clover.....1 lb.

All dry soils, however, (and it should be recollected that *loam* includes every species of soil except clay, peat, and sand,) Sir John Sinclair † thinks, may have from two to four pounds of hop or yellow clover, in addition to four pounds of white, and from four to six pounds of marl-grass, or perennial clover, per acre. And he states the following plan to be recommended by Mr. Bridge, a respectable farmer in Dorsetshire, for laying down lands for permanent pasture, viz. To sow marl or cow-grass, hop or yellow clover, and white clover, in the proportion of from six to seven pounds of each, with one bushel of the best Devonshire rye-grass; by which means "there is a perpetual feed for five or six years." The hop-clover and rye flourish early in the spring; the marl-grass is in perfection in July, when the other goes off; and the white clover is in perfection in August, continuing during the remainder of the season. In some meadows of very rich soil, it is suggested, that lucerne ought to be preferred; and it would be of infinite importance to ascertain the extent to which the culture of that plant could be carried.

* Communications, Vol. III. p. 90. † Ib. p. 10.

III. SAND.

SEEDS.		SUBSTITUTES.	
White clover	7 lbs.		
Trefoil	5 lbs.		
Burnet	6 lbs.		
Ray	1 peck.	Grass-seeds	2 bushels.
Yarrow	1 bushel.	Rib	4 lbs.

Mr. Greenall, however, recommends the following proportions for soils of the like nature, which he has always found to answer, viz. white clover and trefoil, of each five pounds; ray-grass and the best grass seeds (the last collected as they have fallen from the hay) of each one bushel to the statute acre *.

IV. CHALK.

SEEDS.		SUBSTITUTES.	
Burnet	10 lbs.		
Trefoil	5 lbs.		
White clover	5 lbs.		
Yarrow	1 bushel.	Ray	1 bushel †.

For these soils, Mr. Boys of Betshanger, in Kent, advises four bushels of grass-seed, from an old pasture, to be sown with eight pounds of rib-grass; white clover and cow-grass seeds, of each four pounds; and a similar quantity of yellow trefoil; which proportions will be sufficient for an acre of land.

V. PEATY SOILS ‡.

SEEDS.		SUBSTITUTES.	
White clover	10 lbs.		
Dog's-tail	10 lbs.	Yorkshire white	6 pecks.
Ray	1 peck.		
Fox-tail	2 pecks.	Rib-grass	5 lbs.
Fescue	2 ditto.	Cow-grass	4 lbs.
Timothy	1 peck.		

Without specifying any particular soils, Dr. Wilkinson, an

* "Communications", p. 283: there is, however, this great objection to the too common practice of sowing hay seeds indiscriminately—that, beside the impossibility of forming a judicious selection of those most appropriate to the soil, the seeds of weeds are thus unavoidably propagated.—Ed.

† Young, ibid. p. 151.

‡ Ibid. Vol. III. p. 151.

experienced agriculturist of Enfield, Middlesex, recommends the use of trefoil and rib-grass, of each four pounds, white clover twelve pounds, and broad clover four pounds; supposing the grass-seeds to be thrown in with barley or oats. The same gentleman also remarks, that it is of consequence that a full quantity of seeds be thrown in *.

Although the preceding assortment of seeds, adapted to the nature of different soils, may appear sufficiently full and diversified, so as to render any further details on this head unnecessary; yet, as it is a matter of fundamental importance to have seed apportioned for every possible variety of soils, (particularly in returning tillage-land back again to grass,) the following additional remarks, by Mr. Tollet on this subject, will, by their intrinsic merit, forcibly arrest the attention of every intelligent farmer.

Conceiving the degrees of moisture or dryness, rather than the component materials of the land, to be the leading characters that should determine us in the choice of seeds for future pasture, Mr. Tollet accordingly divides the different soils into the four following classes, and specifies the relative proportions of seed best calculated in his opinion for each acre †.

I. UPLANDS, or such dry and light soils as are adapted to the growth of turnips,—

Smooth-stalked poa, or meadow-grass .....6 quarts,	Vernal-grass .....1 quart,
Ray-grass .....4 ditto,	Marl-grass .....3 quarts,
Crested dog's-tail ....6 ditto,	White clover.....2 ditto,
Yellow oat-grass.....4 ditto,	Rib-grass .....2 ditto,
Cock's-foot .....2 ditto,	Yarrow .....2 ditto,

to be sown with barley; which, it may be remarked, is the least prejudicial grain for sowing with grasses intended for permanent pasture; but the practice of sowing any kind of grain along with grass-seeds is not to be recommended. For sandy loams, two quarts of meadow-fescue may be added.

On calcareous, hilly soils, saintfoin should be substituted for the last four plants; and, as the soil approaches a pure chalk, Mr. T. directs the saintfoin to be gradually increased to the exclusion of the rest.

* Young in Communications, Vol. III. p. 243.

† Ibid. p. 439.

II. MIDLANDS, or such soils as are too moist for the turnip husbandry, are, by Mr. Tollet, subdivided into the three following classes, for which he proposes the respective quantities of seed annexed.

1st CLASS includes the driest in point of soil and situation, of which description are those clayey loams that approach to the nature of turnip-land.

Meadow-fescue.....8 quarts,	Vernal-grass .....1 quart,
Smooth-stalked poa ..6 ditto,	Marl-grass.....3 quarts,
Ray-grass .....4 ditto,	White clover .....2 ditto,
Crested dog's-tail....4 ditto,	Rib-grass .....4 ditto,
Cock's-foot dactylis ..2 ditto,	Yarrow .....2 ditto.

2d CLASS comprises such lands as from their situation are higher, though the soil be retentive of moisture.

Meadow fescue.....6 quarts,	Vernal-grass .....1 quart,
Meadow fox-tail ....4 ditto,	Marl-grass .....3 quarts,
Smooth-stalked poa ..4 ditto,	White clover .....2 ditto,
Ray-grass .....2 ditto,	Rib-grass .....4 ditto,
Crested dog's-tail....2 ditto*,	Yarrow .....2 ditto.
Cock's-foot dactylis ..2 ditto,	

3d CLASS contains those lands which from soil and situation, though sound, are of a moister nature.

Meadow fox-tail .....6 quarts,	Vernal-grass .....1 quart,
Rough-stalked poa ...6 ditto,	Marl-grass.....3 quarts,
Meadow fescue.....6 ditto,	White clover .....2 ditto,
Smooth-stalked poa ..4 ditto,	Rib-grass .....2 ditto,
Ray-grass .....2 ditto,	Yarrow .....2 ditto.

It is, however, impossible, adds Mr. T., to give general rules for every variety of soil and situation: a little practice will regulate the proper habitation of each plant. By cultivating them, the farmer will know the meadow fox-tail, the meadow fescue, and the poas, as well as he now knows the ray-grass; and, by observing where they grow naturally on his land, he will have a certain indication of the soil best suited to them.

III. LOWLANDS comprise such lands as are occasionally overflowed by rivers or brooks, and from which we derive our greatest crops of hay; because "their natural moisture is propitious to the growth of our best grasses, and the sediment of the inundations operates as a constant manure: but the turf of

* We apprehend this is the quantity intended, though none is specified in Mr. Tollet's memoir.

these, as well as of other pastures, is filled with rubbish. If, therefore, it is intended to clean the meadow of its improper and noxious plants, the turf early in the spring should be lightly ploughed up, and afterwards cross-ploughed and dragged and harrowed in dry weather, till the whole of the plants are killed, and till the ground be perfectly fine and level. With the first showers in August, it should be sown with the following grasses:—

Meadow fox-tail .....2 pecks,	Vernal grass .....1 quart,
Meadow fescue .....2 ditto,	White clover .....2 ditto,
Rough-stalked poa....2 ditto,	Marl-grass .....2 ditto,
Ray-grass .....2 ditto,	Rib-grass.....2 ditto.

"The foregoing mixture is adapted to the soundest meadow land, where the floods are soon drained off.

"Where the water lies longer, the composition should be as follows:—

Rough-stalked poa....2 pecks,	Flote fox-tail .....3 quarts,
Meadow fox-tail .....2 ditto,	Flote fescue .....4 ditto.
Meadow fescue .....2 ditto,	

"And for situations still more wet, the following:—

Rough-stalked poa....2 pecks,	Flote fox-tail.....1 peck,
Meadow fox-tail .....2 ditto,	Flote fescue .....1 ditto."

IV. FENS include such unsound lands as have, by a certain degree of draining, become capable of some cultivation; whether they are properly fens, or morasses, or peat-bogs.

In the first stage of the improvement of fenny lands and morasses, the water poa is the most proper plant to be cultivated, the great utility of which, in its spontaneous growth, will be hereafter shown*. Mr. Tollet has never heard of its having been cultivated from seed; but there is every reason to conclude, that, in situations resembling its native haunts, it might be introduced to much advantage. He directs, that the land intended to be sown with it should, in April, May, or June, as the weather may permit, be breast-ploughed, and the turf burned. If the land under a favourable season will bear the plough, it should afterwards be ploughed and cross-ploughed, well dragged and harrowed, and the seed sown in August, at the rate of two bushels per acre. Should the land be very tender, it would be better to breast-plough and burn it in the middle of summer, to sow the seed in August, and to cover it

* See Book IX. Ch. II.

as well as can, in that case, be done, by men drawing light harrows over it, and afterwards bush-harrowing it in the same manner. Upon land a degree more sound than the former, and subject to less violent inundations, the flote fox-tail and the flote fescue will be the proper plants; and, in a more improved state, the fiorin.

The land should be prepared for them as before directed, and they should be sown in August, at the rate of one bushel of seed of each per acre.

On lands still more sound, approaching to the moister meadows, Mr. T. would recommend the rough-stalked poa to be added, sowing equal proportions of each, at the rate, in the whole, of two bushels per acre. However, on lands like these, a more eligible mode of cultivating the plants suited to them, would be to set the young plants themselves at the distance of eight inches from each other. The land should be prepared by breast-ploughing, burning, &c. as before. The young plants having been raised from seed sown the preceding August, should be taken up, divided, and set at the distance before directed, as soon after the ground is prepared by the destruction of weeds, &c. as the season will permit, taking care that the ground be sufficiently moist to insure their growth. The first rains after midsummer will probably afford an eligible opportunity. The distance between the plants will enable the hoe to be used to keep them free from weeds; this should be attended to the first autumn and the following spring*. The process, he remarks, may be attended with some expense; but it would occur but once, and it would be creating a valuable pasture, probably for ages.

Peat bogs, or mosses, in favourable situations, admit of very great improvement. These lands, consisting almost entirely of decayed vegetable matter, require the aid of some alkaline substance to bring that matter into action; by the help of which they are capable of being brought to a high state of fertility. When thoroughly drained, the first step should be to pare and burn the peat in considerable quantities, and it should be set with potatoes. This, after the draining, will give the land some time to settle. As soon as it will bear the team, if marl lie contiguous, the first opportunity should be taken of giving it a

* Mr. Tollet has no doubt but this method might be extended with advantage to the sounder meadows.

plentiful covering: with a light ploughing, the ground should be sown with oats and proper grass-seeds. The following winter, or early in the spring, a good top-dressing of marl should be applied to the turf; and thus lands of this nature may be turned into tolerably good pastures. If they could be irrigated, their value would be greatly increased; and if the water carried over them were impregnated with calcareous matter, they would become an artificial imitation of the famous Orcheston meadow, and rival it in produce. Next to marl, lime is the proper agent to resort to.* But it is recommended that this be always mixed with some sort of soil, in the proportion of about one-third lime to two-thirds soil. The best substance for this mixture is clay; but Mr. Tollet would even use keen gravel rather than not mix it, as it would tend to give a firmness and soundness to the surface.

The different degrees of moisture should regulate the choice of the plants as before directed. Where the peat land is made thoroughly sound and marled, the plants recommended for meadows are proper to be cultivated thereon, in all cases adding a quart of the sweet-scented vernal-grass to the composition.

In moister situations, equal quantities of rough-stalked poa, flote-fox-tail, and flote-fescue, with two quarts of vernal-grass, would be suitable; and in situations still more wet, a bushel of flote-fox-tail, and the like quantity of flote-fescue, with two quarts of vernal-grass, would be the proper composition. These grow with such luxuriance that, in some meadows there is barely room, when it is made into hay, for the lap-cocks, without touching each other †.

An uncommon instance of superior management in soils of this description occurs in Mr. Young's "Annals of Agriculture," which he justly accounts, in common with many excellent cultivators, one of the most original discoveries he has any where met with, in the improvement of grass-land.

"Mr. Salter, of Winberg, near Dereham, upon his large farm of above 800 acres, found 3 or 400 acres of old meadows entirely poisoned by springs, which, from every sort of impediment that neglect could cause, had formed bogs and moory

* Where chalk is to be had, it will answer every purpose of lime.

† Agricultural Survey of the County of Antrim, Vol. I. p. 249. See also Book IX. Chap. II. of this work.

bottoms, famous for rotting sheep and miring cows; with blackthorns and other rubbish spread over large tracts. His first operations were to grub and clear the land, and open all ditches to the depth of four or five feet, and to cut open drains in almost every direction for laying them dry; burning the earth and spreading the ashes on the ground: so far, all was no more than common good husbandry. But he applied a thought entirely his own: as he found that the flinty gravel, marl, and other earths, but especially the gravel, were very beneficial to the herbage, he thought of sowing winter tares and white clover upon the places wherever any earth was spread, or any other operation had laid bare the surface, harrowing in those seeds. I had the pleasure of seeing several of these crops growing; the success has been uncommonly great; for the land thus sown not only has given large and very profitable crops of hay, but has also received a rapid improvement in the herbage; the cover and shade of the tares, so beneficial to all land, mellowed the surface, and seemed to draw up, as well as protect, such of the old plants as received improvement from the manure, and exhibited a much superior fleece of grass to any spots where this singular management had not taken place. So that nothing can be clearer, on viewing this large tract of meadow, than the superiority of the improvement resulting from the growth of the tares: the effect of the manure is much accelerated and rendered greater. The idea is certainly applicable to many of the grass-lands of the kingdom, especially such as are improving by the addition of chalk, marl, clay, loam, sand or gravel; forty loads an acre of any of these bodies, will much improve coarse, or wet, or moory grass-lands; and then to add tares secures an immediate profit, and makes the manure work much sooner and more powerfully. He sows some so late as the middle of May. An idea here strikes me, which I shall venture to add; that if I was to scarify any mossy, hide-bound, or poor pastures, &c. it should be with a drill scarifier, drilling in winter tares by every tooth of the scarifier; and I have no doubt but the tares would take well, and effect a considerable improvement, even without manuring. Mr. Salter has practised the tare husbandry on meadows for ten years; but his first beginning was seventeen years ago, at Ellingham: the cock-chafer-grubs had destroyed a part of a meadow; he harrowed in tares and seeds, and the success was great."

Beside these rotations, or courses of seeds for grass-lands, there are several others which have been practised by intelligent farmers, and are deserving of notice.

The following proportions were sown a few years since by the Earl of Darlington:—

White or Dutch clover	17 lbs.
Clean hay-seeds	14 bushels.
Rib-grass } Trefoil }	1½ lbs.

By which means (the soil being previously ploughed very fine and made perfectly level) the land was speedily covered with a thick and excellent herbage.

Mr. Dalton's (of Sleningford) mode of laying down land to grass*, is to make the ground perfectly smooth and level, and then sow upon every acre the following seeds, viz.

Hay-seeds	6 bushels.
Rib-grass	12 lbs.
White or Dutch clover	8 lbs.
Burnet	5 lbs.

He manures it well with a compost of earth, dung, and ashes, thoroughly mixed together; and folds his sheep upon it, two nights in the same place, which practice answered uncommonly well.

In the laying down land for the purpose of forming a good meadow, greatly superior to the generality of pastures, the late Mr. Curtis recommends the six following grasses, and two species of clover, to be mixed in these proportions:—

Meadow fescue-grass, one pint.	Crested dog's-tail, one fourth of a pint.
Meadow fox-tail grass, ditto.	Sweet-scented spring-grass, ditto.
Rough-stalked meadow-grass, half a pint.	White or Dutch clover, half a pint.
Smooth-stalked meadow-grass, do.	Common, or red clover, ditto.

(For wet land, the crested dog's-tail and smooth-stalked meadow, Mr. C. says, may be omitted, especially the former.)

These are to be mixed together, and about three bushels of them sown on an acre, in rows, in order that they may be more conveniently hoed, in consequence of which they will vegetate

* Young's Northern Tour.

with increased luxuriance*. Towards the end of August, or early in September, Mr. C. states, that it will be necessary to weed and thin the grasses occasionally, and also to roll them in the spring; by which means the roots, that may have been raised by the frost, will be pressed into the ground. For *moist* lands, he conceives the meadow fox-tail and meadow fescue grasses to be best adapted; as the smooth-stalked meadow and crested dog's-tail are to dry pastures; while the sweet-scented vernal grass and meadow-fescue will suit land that is either moist or moderately dry. These plants are asserted to form a good turf speedily; being, for the most part, vigorous perennials, they are not liable to be overpowered by the spontaneous growth of coarse vegetables indigenous to such soils; and, if the land be previously cleansed from all weeds and noxious plants, the combination of grasses above specified will, in the course of two years, produce a most excellent method.

Mr. Salisbury, the able successor of Mr. Curtis, has improved upon his practice, and has succeeded in forming permanent meadows according to the following method, for which he was honoured with the silver medal of the Society for the Encouragement of Arts. To accomplish this object, he observes, three things are necessary, viz. to clean the land; to procure good and perfect seeds adapted to the nature of the soil; and to keep the crop clean by eradicating all the weeds till the grasses have grown sufficiently to prevent the introduction of other plants. The first two of these requisites having been already discussed, we proceed to notice the result of Mr. Salisbury's successful practice.

"Grass seeds, he states, may be sown with equal advantage both in spring and autumn: in one particular instance, the land was sown towards the end of August; and the seed employed was, one bushel of meadow fescue, and one bushel of meadow fox-tail grass, with a mixture of 15lbs. of white clover and trefoil. The land was previously cleaned as far as possible with the plough and harrow, and the seeds were sown and covered in the usual way. In the following October, a prodigious crop of annual weeds of many kinds had grown up, and were in bloom, covering the ground and the sown grasses: the whole of these weeds, being then mown and carried off the

* Practical Observations on British Grasses, 8vo. p. 33.

land, were at once destroyed; and, while their stalks and roots were decaying, the sown grasses were gaining strength, and the few perennial weeds which were among them, were drawn by hand in fine weather. The whole was repeatedly rolled, to prevent the worms and frosts from throwing the plants out of the ground; and, in the following year, there was a remarkably fine field of grass*. For the more recent and interesting experiments of the Duke of Bedford, we must refer to the able account in the *Hortus Gramineus Woburnensis*, which is too voluminous to be inserted here, and yet too important to be passed over unnoticed.

Where land is intended chiefly for sheep pasture, it has been recommended to sow three sorts of grasses, in order to obtain the benefit of successive growth. Agreeably to this practice, Mr. Parkinson, an experienced farmer, sows four bushels of ray-grass, or red darnel seed, ten pounds of trefoil (more correctly common clover) seed, and ten pounds of white clover. Thus, he thinks, the ray-grass should be fed off early, before the white clover appears, and while the trefoil or common clover is just springing forth; so that when the ray-grass is eaten down, the common clover will shoot up, and afford excellent food, which will be succeeded by the white clover: and, when this last is eaten, the ray-grass will again vegetate, and afford a supply of food during the winter months. From this practice, Mr. Parkinson infers, that one-third more in number of sheep may be sustained than can be effected by any other method.

Generally speaking, however, where the lands thus laid down to grass are intended for sheep, it is not an object of very great moment to sow only the finer sorts of grass, because close-feeding will, after the first year, make any of the coarser kinds fine, sweet, and productive. To this circumstance of close-feeding, that is, preventing the seeds from rising, the Wiltshire downs are indebted for the *sweetness of their bite;* which, Mr. Davis has judiciously remarked, depends more on its being kept close and being eaten as fast as it shoots, than on any peculiar good quality of the grass itself; for there are many downs that, when closely fed, appear to be a very sweet pasture; but which, if suffered to run one or two years, without

* Transactions of the Society of Arts, &c. Vol. XXVII. p. 67—72.

being fully stocked, will become so coarse that sheep will almost prefer starving to the eating of such grass *. And Mr. Young, jun. has had two hundred acres of land, under his management, laid down chiefly for sheep, the fields of which he has stocked so early in the spring, and so thickly, as just to keep down the seed stems; by which management the cock's-foot, oat-grass, and Yorkshire white, have proved sweet-feeding grasses, that were not at all rejected even where the flock had a choice †. But it should seem that where a field has been long pastured in this way with sheep, and closely fed, it ought not to be converted into a meadow in order to be mown for hay; because the plants, by being constantly cropped down, acquire a dwarfish habit, however quick their growth may be in that early stage.

With regard to the time and method proper for sowing grass-seeds, there is a difference of opinion, not only as to the season for depositing the seeds in the ground, (which is either in the spring, in conjunction with grain-crops, or towards the end of summer, or in August, where the soil has been previously prepared by means of green or other fallows,) but also as to the propriety or necessity of sowing them with or without other vegetable crops.

Not to enter into a discussion of the arguments produced in favour of these practices, we state the following results of actual experiments by intelligent agriculturists. Mr. Lyster, of Bawtrey, found, on comparing the *vernal* and *autumnal* sowing, that the latter was much the better. Mr. Dickson, of Belford, made a comparative experiment in the spring; four acres with grasses only, on peas and buck-wheat ploughed in the preceding autumn; five acres with barley; and five with the seeds alone, without either corn or manure. The two divisions that were sown alone were over-run with chickweed, and would have been choked, if this had not been consumed by a dairy of cows: from that time for a period of seven years, no difference was perceptible between the three divisions. From the extensive experiments of the Earl of Holderness, it appears, that seeds answered best when sown alone. The fact, however, is, as an intelligent agriculturist has remarked, that grass-seeds will succeed almost equally well in either method; though, if a

* Agricultural Survey of Wiltshire, p. 18.

† Communications to the Board of Agriculture, Vol. III. p. 151.

preference were given, it should be to August sowing without corn; but the success which he has witnessed in both seasons, does not allow any positive opinion. Moors and mountains form an exception; in such situations, snows fall too early to hazard such sowings, which ought, therefore, never to take place in autumn, or be ventured later than the first week in August. But the better season is the spring, with oats, either for soiling or hay *; though, on *strong land*, that sort of barley which runs least to straw, and is earliest ripe, is far preferable to oats, on account of the tendency in barley to loosen the texture of the ground whereon it grows, and consequently favour and accelerate the growth of the grass †; and, for the same reason, on yet stronger land, grass-seeds may be advantageously sown with thin crops of beans.

Having already adverted to the necessity of bringing grass-lands into a fine state, we shall at present only remark, that where a vernal sowing takes place with a crop of corn, the tillage ought to be given with more than common attention. Hence the land should be ploughed thrice, and afterwards harrowed, or scuffled and rolled, according to the nature of the soil; for, whatever that may be, the ground should be well reduced for grass-seeds. This, attention, however, is not so necessary for an August sowing; because the time and season afford so ample an opportunity to prepare, that, if the first earth had been given in autumn, the most negligent farmer can scarcely find any other difficulty than what arises from an uncommonly wet season ‡. But, in order to complete the formation of a good meadow, it is necessary that the seed be sown as early as possible after the soil has been ploughed, and with as much regularity and uniformity as is practicable. Hence it is obviously necessary that an expert seedsman be employed, and also to guard against the bad practice of seedsmen, who are apt to mix seeds which are nearly of the same size, in order to have the fewer casts. Uniformity of delivery is a point of the greatest consequence; and the lighter sorts of grass-seeds should never be sown in windy weather, or in wet seasons, when the least degree of poaching might ensue. All grass-seeds should be covered

* Rev. A. Young, in Communications to the Board of Agriculture, Vol. III. p. 142.

† Rev. Edmund Cartwright, ibid. p. 184.

‡ Young, in Communications, Vol. III. p. 143.

in, by passing a very fine light pair of harrows once over them; and, in the case of light or porous soils, they may be advantageously rolled.

The successive or autumnal management is a point of considerable consequence, and this in proportion to the moisture of the soil. All trampling by cattle and horses is very pernicious; for the soil, after a grain crop, or after the tillage of a fallow, is very "tender," and affected by every impression. Every sort of stock, therefore, should be carefully excluded throughout the following autumn and winter; for the profit resulting from the bad practice of too early feed is very small, and not to be compared with that derived from it as a *spring* pasturage for ewes and lambs.

The sweetness of pastures on many sheep-downs, we have already observed, depends on the closeness of the feeding; hence many intelligent cultivators, in the North Riding of Yorkshire, feed their new lays with sheep for the first two years *. And where ray-grass and white or Dutch clover are intended to remain for some years, it has been found profitable to feed them the first year with sheep, which thicken, close, and render them more permanent †.

The *mowing* of new lays is a beneficial practice, particularly in moist meadows, the soil of which will of course suffer by poaching; in this case, however, it should be early cut, as nothing is more pernicious to new layers, than that the grass should run to seed. From an accurate comparative experiment, by Dr. Wilkinson, of sheep-feeding with mowing, the superiority of the former was indeed very great; hence it should seem to be the most profitable management to feed a new lay with sheep for the first two or three years, beyond which time there will be no necessity to continue it any longer ‡; though the Rev. Mr. Young states, that he has had some fields under his care, which succeeded well in feeding four, five, and even six years. In general, he observes, it may be laid down as a rule, that the more land is sheep-fed the more it will be improved, especially if, at any future time, it should be again

* Agricultural Report of the North Riding of Yorkshire, p. 48.

† Corrected Agricultural Report of Perthshire, 8vo.

‡ Care should, however, be taken not to turn sheep upon young lays until the grass is firmly rooted in the ground, as they are otherwise apt to pull the tender shoots out.—Ed.

ploughed for corn; but, in this system of sheep-feeding, the unnecessary and impoverishing practice of removing sheep to be folded in other places, must on no account be attempted.

If the preceding hints be duly regarded, little apprehension can be entertained of a failure; though such an event may possibly take place in extremely unfavourable seasons. It can, however, scarcely happen to more than one or two sorts of seed; and in this, or indeed in any case of failure, fresh seeds should be sown in moist weather, during the spring. It will also be advisable to tread them in by turning a flock of sheep into the field, if practicable; but, if this cannot be done, Mr. Young is of opinion, that it should take its chance, for a roller will not so well effect it. If a very large fold, five or six yards to a sheep, be run over a field, once in a place, and the seeds be sown before the sheep are permitted to enter, success will be almost certain.

Should, however, a total failure, from any unforeseen circumstance, take place, he recommends, in fields that were sown in the spring, to clear the grain as early as possible; and, ploughing once, to harrow in fresh seeds immediately. These will succeed very well, if they be got in during the month of August—the sooner the better—and in this case the land ought to be very well rolled in the month of October, in a dry season. If the failure happen on land sown in August, he advises to give the land three *earths*, or ploughings, in dry weather in the spring, and to re-sow grass-seeds with buck wheat in May; of which he remarks, that though it be not a crop calculated for clays and wet loams, yet it sometimes answers in dry summers; and in wet seasons, though it will give little seed, yet it may be mown, while in blossom, for soiling cows *.

If the land be laid down agreeably to the hints already given, manure will not be found *essential*, notwithstanding it will at all times be *beneficial*. In addition, therefore, to the remarks already stated on the subject of manuring grass-lands, we have to observe, that, if manure be applied the first year, the best time for this purpose is in August or September, being then a year old, when a moderate dressing will greatly contribute to promote the thickening of the herbage. But, on soils that

* Rev. A. Young, in Communications to the Board of Agriculture, Vol. III. pp. 156, 157.

are rather unfavourable to grass, and on which the success is at all doubtful, (if the application of manure can only be once made,) it would be better delayed to the period when new lays are apt to fall off, that is in August, in the third year; but, if the grass be mown, the best time for manuring land will be immediately after clearing off the hay.

Early in March, the grass of old-watered meadows is, in general, sufficiently forward to receive sheep, which are accordingly fed on it during that season; and to those farmers or graziers, who reserve water-meadows for the purpose of breeding or fattening sheep, the grass thus produced is almost invaluable, on account of the scarcity of green feed which then usually prevails. In order to afford an abundant pasturage to any kind of farming stock, (for, though the general practice is to admit only sheep into water-meadows, yet, upon good, sound gravel, Mr. A. Young, sen. thinks, *any heavier* stock may be allowed to enter them,) the water should, according to Mr. Wright, be taken off for nearly a week, that the land may become dry and firm before the heavy cattle are admitted. In the first week of eating off the grass of water-meadows, it will be proper to give the cattle a little hay in the evening, to intermix with their moist food. But the best mode of employing such grass, is to hurdle off certain pieces or spots, in the same manner as is practised for turnips. The ewes and lambs are to be removed toward the end, or at all events, on the last day, of April, by which time the land will probably be fed bare; and it should be remarked, that the closer meadows are fed, these will be more improved, and the subsequent crop of hay will be finer in quality. Immediately after the stock are cleared out, Mr. Boswell* directs a week's watering, with a careful examination of every trench and drain; taking particular care that the water only dribbles over every part of the panes as thin as possible, this being the warmest season of the year; and also to mow the long grass that obstructs the water in the trenches, which operation is best performed at this time. The weeds, leaves, &c. are to be taken out, and thrown into heaps, for carriage to the farm-yards. The first watering should not be suffered to continue longer than two or three days, before it is shifted off to another part.

* Treatise on watering Meadows, p. 110.

or meadow, which, by this time, may be fit for receiving the water; and thence to a third or fourth meadow, if the occupier possess so many. Should the season prove *wet*, the water ought not to remain so long on the ground, warmth being the greatest requisite, after the land is once wet, to assist vegetation; and in the course of five, six, or seven weeks, the meadows will be fit to mow for hay. By the time three or four parts, or meadows, have been thus regularly watered, the first will be found to have an after-math, *eddish*, or after-grass, with an astonishingly rich and beautiful verdure; and both the quantity and quality of the produce will greatly exceed what could be expected, when compared with the state of the lands before they were irrigated. This after-grass is eaten off in autumn by cattle, especially milch-kine; but sheep ought on no account to be permitted to enter water-meadows in that season, as they will infallibly be *rotted*. Although the cause of the rot is at present unknown, yet it is an indisputable fact that the autumnal feeding of sheep in water-meadows is as destructive as the vernal pasturage is beneficial to them. Hence Mr. Boswell advises, that "no sheep, except those which are just fat, must be suffered, even for an hour, in water-meadows, except in the spring of the year; and even then care must be taken that every part of the meadow be well watered." And he adds, that water-meadows, made from low, boggy, or swampy land, will infallibly rot the sheep at any other season than the spring; though a contrary effect is produced when the meadows are made from dry land *.

Having already noticed the comparative advantages resulting from the scarifying, or rolling, of grass-lands in general, we shall at present only remark, that the rolling of water-meadows during the spring is an excellent method. It should be done after Candlemas, when the land has been laid dry for a week; and the meadow to be rolled "lengthways of the panes", up one side of the trench and down the other. This practice also contributes greatly to the grass being mown close to the surface, an advantage of no trifling consideration; for the ant-hills, mole-hills, and other obstacles to the scythe being thus pressed close to the ground, the mowing will be fairly and clearly performed; whereas, when this circumstance is not duly regarded, the

* Boswell's Treatise, p. 112.

workmen will always mow over them, in order to avoid the inconvenience resulting from the edge of the scythe being taken off, and consequently the work is imperfectly executed, while much valuable hay is necessarily lost.

CHAPTER VI.

ON HAY-MAKING.

THE time of cutting grass for hay ought to be regulated according to its growth and maturity for affording the best and most nourishing food; it being extremely detrimental to grass-crops to cut them too early, because the sap has not properly circulated throughout the blade; so that, when the grass is converted into hay, it shrinks, and is materially reduced in point of quantity. The grass, however, will receive equal injury, if it be allowed to stand till it shed its seeds; the best time, therefore, for mowing water-meadows is when the grass is in full blossom; with respect to other grass-lands, when the tops of the grass appear brown, it is an indication that it is in a proper state for cutting. Another criterion for directing the farmer's attention to this business, where grass is very thickly spread over the field, is afforded by the yellow hue which the bottom parts of the blades assume before the grass becomes in full flower; in this case, also, it will be necessary, as speedily as is practicable, to mow the grass, which will otherwise be liable to *rot*, or at least to acquire an unpleasant flavour, that will consequently diminish its value.

But although the quantity of produce may be increased by allowing the grass to perfect its seeds before it is cut, yet the value of the after-math will be generally injured in a greater proportion than the increased quantity thus gained; besides the impoverishing effects of the plants on the soil, and the less palatable quality of the hay *.

The very early or rich meadows, and highly-manured upland pastures, in the neighbourhood of large towns and cities, will be ready for mowing in June; and all meadows and pastures which

* See Sinclair's *Hortus Gram. Woburn.*, p. 214, Third 8vo. edition.

may not be cut in that month, ought to be mown in July. In performing the work, the chief object is to see that the grass be cut as close to the ground as possible, and perfectly level; for grass, Mr. Young remarks, will never thrive well that is not mown quite close; and the loss in the crop of hay is very considerable, as "one inch at bottom weighs more than several at the top."—According to the present mode of mowing grass, the labourers trace two parallel lines with their feet, which they move forward alternately, after every stroke of the scythe: in lieu of this method it has been recommended, by the late eminent agriculturist, Du Hamel, to trace the mower's path in a single line only; because he ought to advance with one foot before the other in such a manner that the left foot, which is behind, should always forward the right foot. By adopting this practice, it is stated, that the labour will be performed both with greater despatch, and also with more ease to the labourers, who will thus be secured from those sudden and painful cramps in the left side, with which they are often attacked in the common mode of cutting grass.

In hay-making, or converting grass into hay, it is of essential importance to have a proper supply of hands ready for the work. In some districts two or three are reckoned to be sufficient to attend a mower (who, if he be an expert workman, and the soil and crop be favourable to his labour, can cut from three quarters to one acre in a day); but in the county of Middlesex the allowance is five hay-makers, of both sexes, including loaders, pitchers, stackers, &c. In that county the making of hay has been brought to a degree of perfection altogether unequalled by any other part of the kingdom; and which, after having stood the test of long practice and experience, is found to be attended with the most desirable success. Even in the most unfavourable weather, the hay made according to the Middlesex manner is superior to that made by any other method, under similar circumstances; we shall, therefore, state this practice (which is little known beyond the boundaries of that county) for the information of our readers, from Mr. Middleton's very interesting "Corrected Report of the Agriculture of Middlesex."

"*First day.*—All the grass mown *before* nine o'clock in the morning is tedded (or spread), and great care taken to shake it out of every lump, and to strew it evenly over all the ground. Soon afterwards it is turned, with the same degree of care and attention; and if, from the number of hands, they are able to

turn the whole again, they do so, or at least as much of it as they can, till twelve or one o'clock, at which time they dine. The first thing to be done after dinner is to rake it into what are called *single* wind-rows *; and the last operation of this day is to put it into grass-cocks.

"*Second day.*—The business of this day commences with tedding all the grass that was mown the first day *after* nine o'clock, and all that was mown this day *before* nine o'clock. Next, the grass-cocks are to be well shaken out into staddles (or separate plats) of five or six yards diameter. If the crop should be so thin and light as to leave the spaces between these staddles rather large, such spaces must be immediately raked clean, and the rakings mixed with the other hay, in order to its all drying of a uniform colour. The next business is to turn the staddles, and after that to turn the grass that was tedded in the first part of the morning once or twice, in the manner described for the first day. This should all be done before twelve or one o'clock, so that the whole may lie to dry while the work-people are at dinner. After dinner, the first thing to be done is, to rake the staddles into *double* wind-rows †; next, to rake the grass into *single* wind-rows; then the double wind-rows are put into bastard-cocks; and lastly, the single wind-rows are put into grass-cocks. This completes the work of the second day.

"*Third day.*—The grass mown and not spread on the second day, and also that mown in the early part of this day, is first to be tedded in the morning; and then the grass-cocks are to be spread into staddles, as before, and the bastard-cocks into staddles of less extent. These lesser staddles, though last spread, are first turned, then those which were in grass-cocks; and next, the grass is turned once or twice before twelve or one o'clock, when the people go to dinner as usual. If the weather has proved sunny and fine, the hay which was last night in bastard-cocks, will this afternoon be in a proper state to be carried ‡; but if the weather should, on the contrary, have been cool and

* That is, they all rake in such manner, as that each person makes a row, which rows are three or four feet apart.

† In doing which, every two persons rake the hay in opposite directions, or towards each other, and by that means form a row between them of double the size of a single wind-row. Each of these double wind-rows are about six or eight feet distant from each other.

‡ It seldom happens, in dry weather, but that it may be carried on the third day.

cloudy, no part of it probably will be fit to carry. In that case, the first thing set about after dinner, is to rake that which was in grass-cocks last night, into double wind-rows; then the grass which was this morning spread from the swarths, into single wind-rows. After this, the hay which was last night in bastard-cocks, is made up into full-sized cocks, and care taken to rake the hay up clean, and also to put the rakings upon the top of each cock. Next, the double wind-rows are put into bastard-cocks, and the single wind-rows into grass-cocks, as on the preceding days.

"*Fourth day.*—On this day the great cocks just mentioned, are usually carried before dinner. The other operations of the day are such, and in the same order as before described, and are continued daily until the hay-harvest is completed.

"In the course of hay-making, the grass should, as much as possible, be protected both day and night, against rain and dew, by cocking. Care should also be taken to proportion the number of hay-makers to that of the mowers, so that there may not be more grass in hand, at any one time, than can be managed according to the foregoing process. This proportion is about twenty hay-makers (of which number twelve may be women) to four mowers: the latter are sometimes taken half a day to assist the former. But in hot, windy, or very drying weather, a greater proportion of hay-makers will be required than when the weather is cloudy and cool.

"It is particularly necessary to guard against spreading more hay than the number of hands can get into cock the same day, or before rain. In showery and uncertain weather, the grass may sometimes be suffered to lie three, four, or even five days in swath. But before it has lain long enough for the under side of the swath to become yellow, (which, if suffered to lie long, would be the case,) particular care should be taken to turn the swaths with the heads of the rakes. In this state it will cure so much in about two days as only to require being tedded a few hours, when the weather is fine, previous to its being put together and carried. In this manner hay may be made and stacked at a small expense, and of a good colour; but the tops and bottoms of the grass are insufficiently separated by it.

"There are no hay-stacks more neatly formed, nor better secured, than those of Middlesex. At every vacant time,

while the stack is carrying up, the men are employed in pulling it, with their hands, into a proper shape; and, about a week after it is finished, the whole roof is properly thatched, and then secured from receiving any damage from the wind, by means of a straw rope extended along the eaves, up the ends, and near the ridge. The ends of the thatch are afterwards cut evenly below the eaves of the stack, just of sufficient length for the rain-water to drip quite clear of the hay. When the stack happens to be placed in a situation which may be suspected of being too damp in the winter, a trench of about six or eight inches deep is dug round, and nearly close to it, which serves to convey all the water from the spot, and renders it perfectly dry and secure.

"The Middlesex farmers are desirous of preserving the green colour of their hay as much as possible, though a lightish brown is of no disservice to it. Hay of a deep brown colour, occasioned by its having heated too much in the stack, is said to weaken the horses that eat it, by promoting an excess of urine, and consequently it sells at a reduced price *.

"In the making of hay, some attention should be paid to the quality of the soil, and the kind of herbage growing on it. The hard, benty hay of a poor soil is in little or no danger of firing in the stack; and should, therefore, be put very early together, in order to promote a considerable perspiration, as the only means of imparting a flavour to such hay, which will make it agreeable to horses and lean cattle: it will be nearly unfit for every other sort of stock.

"It is the succulent herbage of rich land, or land highly manured, that is more likely to generate heat sufficient to burst into flame, as it has sometimes done: of course, the grass from such land must have more time allowed in making it into hay. This the Middlesex farmers are perfectly aware of; and, when the weather proves moderately drying, they make most excellent hay. But when very hot or scorching, they, as well as

* A correspondent observes, that if you would make your hay come out of the stack of a fine colour, and the beauty of the flowers to appear, the hay you have shaken out of bastard-cocks, to prepare for carting, should be cocked in the heat, and remain till the next morning; then turn and open the cocks, for the air to take away the damp that is collected, which otherwise would heat in the stack, and of course the beauty of the colour would be done away.

most other farmers, under similar circumstances, are sometimes mistaken. In such weather the grass becomes crisp, rustless, and handles like hay before the sap is sufficiently dissipated for it to be in a state fit to be put into large stacks. But if that be done when it is thus insufficiently made, it generally heats too much, sometimes becomes *mow-burnt*, and in some cases, though very rarely, has taken fire."

It would be difficult to improve on the foregoing practice: we shall, however, state a few other modes, either followed in other counties, or recommended by agriculturists for adoption.

The following excellent method of making hay, particularly in *wet weather*, (a most important object in our variable climate,) is chiefly practised in Wensley Dale, Yorkshire, and may be beneficially adopted in the more northern parts of this island, as well as in situations similar to that of Wensley Dale; where the surrounding hills cause rain to fall much more frequently than in an open country.

The grass is cut as low as possible, and on the day following is strewed *with the hands* in such a regular and even manner, that no lumps appear on the surface. In this part of the work, neither forks nor rakes are used, except where the grass is very light indeed. The next process, the day after, if the weather be fine, is, to turn it with the rake-head in a very neat and regular order: on the succeeding day, if the weather be fine, it is put into *hand* or *lap-cocks*; one raker goes before a cocker; each cocker takes up about 8 or 10lbs. weight of hay, shakes it up very lightly, then puts one hand a little under it, and the other on the side of it, takes it up and sets it down again gently, where it is raked clean, in a neat regular row, leaving a hole about the middle in the side of the cock, so as to admit air in case of wet weather. Cocks made in this manner, it is asserted, will repel the rain, and throw it off better than any large cocks carelessly and hastily put together with the rake or fork, and are also less liable to be disturbed by wind or tempests. This mode of hay-making is affirmed, on the test of nearly fifty years' experience, to be far preferable to any other; as ricks of a circular form, with a conical head, are preferable to long ricks, being less liable to injury from the weather in this than in any other shape *.

* In Hay-making, especially in wet Weather, by Mr. Milner of Scorton, near Catterick, Yorkshire, in Communications to the Board of Agriculture, Vol. VII. Part I.

In making hay from watered meadows, the grass should be *tedded* immediately after it is cut, in which state it may remain all the first day. On the following morning, as soon as the dew is evaporated, it must be repeatedly turned, and formed into small cocks, the trenches and drains being raked clean out. The next day it is again tedded and raked nearer together; the grass occupying a less space of ground in proportion as it withers: it is afterwards repeatedly turned in the course of the day, and long before night formed into rows, afterwards into large cocks, and the ground is again raked around them. On the succeeding day those cocks are again spread and turned: when, if they be not sufficiently dry, they are put into still larger cocks; and the following day they are opened, and the grass, after being turned, is carried to the stacks *.

The method recommended by Mr. Boswell corresponds, in some respects, with that proposed by Dr. Anderson. This eminent agricultural philosopher directs the grass not to be cut until it is perfectly dry; immediately after which it is to be formed into small, narrow cocks, about three feet in height, each cock being slightly thatched by drawing a little hay from the bottom of the cock, that is laid on the top, with one of the ends downwards. By this expedient the hay is stated to be effectually secured from rain and wind, except indeed a violent storm should occur immediately after forming the cocks. Provided the grass be thoroughly dry when these cocks are formed, Dr. A. asserts, they will never fit so closely as to heat; though, in the course of one or two days, they will become so firm, that a hurricane only can overturn them. In these cocks, he further directs the hay to remain for one or two weeks, till, on inspection, it is judged they will keep in pretty large *tramp-cocks;* when two men, each being provided with a pitchfork, carry the small cocks to the spot where the tramp-cocks are to be formed. The benefits resulting from this practice are stated by Dr. A. to be—a considerable reduction of labour; and that the hay continues nearly as green as when it was first cut, and also retains its natural juice, in the greatest perfection; whereas, by tedding it, &c. as is usually done, the grass becomes bleached, its juices are exhaled, and the hay is often injured by rain. Much caution, however, must be observed, that the grass be thoroughly dry, when first formed

* Boswell's Treatise on Watering Meadows, p. 130.

into small cocks; as, if there be the least degree of moisture, the grass will, in a very short time, become mouldy, and clog so closely together as to be impenetrable to the air, and never become properly dry without exposure to the sun. To prevent any accident of this sort from occurring, Dr. A. recommends the mowing to be begun during fine, serene, and settled weather, in the morning, and on no account to let the hay-makers touch it till the dew is evaporated.

A middle course has been suggested in the "Phytologia" of the late Dr. Darwin, between the different modes of hay-making in use in the northern and southern parts of this island. If the swath of mown grass be turned over only *once* in the day, for three or four successive days, the interior parts of it will, in a manner, be dried in the shade; and, if it were spread over the ground for a few hours in the day, he thinks the hay would become dry enough for stacking. At night, Dr. D. strenuously advises to form the grass into small cocks—particularly in damp weather—in order to secure it from being injured by the slime and excrements of the very numerous worms that rise to the surface of the ground during moist, warm nights. With this view the cocks are to be made as high in proportion to their base as possible, that a small surface may come in contact with the ground, while a broader top is exposed to the air, and consequently the exhalation of moisture from the hay is promoted, while it is at the same time secured from accidental showers.

In wet weather Dr. Darwin is of opinion, that it is best to turn the swath every day, or every second day, or to form it into small cocks, with the view of sheltering the whole from injury by long-continued rains, and also of preventing the parts next the ground, as well as in the middle, from fermenting. When the weather is more favourable, Dr. D. directs the hay to be made into large cocks, for the more speedy exhalation of moisture by the action of the air, while an incipient fermentation will evolve or discharge a portion of heat, and thus promote the drying of the hay by increasing the evaporation.

Various contrivances have been suggested, under the name of *hay-sledges* and *hay-sweeps*, in order to promote the getting hay together in showery or unfavourable weather. Of the former description is the sledge, employed for this purpose in Yorkshire: in loading it, the hay is previously raked into rows;

the sledge is then brought to the end of one of them, and one of the horses is made to pass on each side, until a quantity proper for a load is collected together. One of them now crosses the hay-row, when the load is conveyed to the stack; after which the horses are turned round, and the sledge is drawn back to the field for another load. With this hay-sledge and two horses the hay may be loaded, and conducted to the spot where the stacks are forming, more speedily than can be effected by a cart. It is a simple and effective implement, and appears to be chiefly calculated for dry lands, the surface of which is irregular, or where the ridges are high; as Mr. Middleton's *hay-sweep* is eminently adapted for ground of a contrary description. As our limits will not permit a detail of the machinery of which this contrivance is composed, we can only state that, previously to using it, the hay is to be formed into rows; and the horses being harnessed, the drivers mount them, and drive them slowly on, so that the sweep collects the hay within it. Should the ridges be high, or the surface of the soil be irregular, it will be requisite to stick the prongs of a fork occasionally into the hay, just *before* the machine, in order that this may more effectually catch it. When the *sweep* is full, and the load is to be drawn to a distant place, the horses must be kept as closely together as possible *. In a wet summer this contrivance will be found peculiarly serviceable; and, if the drivers be steady, and the horses tractable, or accustomed to the work, *ten acres* of hay, it is said, may be effectually secured in the space of little more than *one* hour.

Before we dismiss this subject, we would call the attention of the industrious farmer to the minutiæ of management that might otherwise possibly escape him, amid the multiplicity of his necessary engagements, viz. That he turn his store-cattle for a few days into the meadow immediately after the hay is cleared out of it, "to pick about the hedges", as the phrase is in West Devon. For the herbage, which is then succulent and edible to the store cattle, would, before the after-grass was ready to be pastured off, become unpalateable, and be altogether neglected by young cows or fatting stock, with fresh succulent herbage

* Transactions of the Society for the Encouragement of Arts, &c. Vol. XIV. where Mr. Middleton's hay-sweep is described and illustrated by an engraving, representing it at work.

before them. It would, however, be evidently improper for such cattle to continue in newly-mown grounds after they have performed the principal object of attention.

Various modes are practised, in order to make the most of the AFTER-GRASS or *rowen*, which is in much request for cows. In the vicinity of large towns, therefore, or where lambs are suckled to a great extent, it may be advantageous to take a second crop of hay, in the mowing of which greater attention is necessary than in the first instance, from the greater difficulty of cutting the grass-crops occasioned by their lightness; so that, unless in the case of very skilful mowers, the scythe is apt to rise and pass over the grass without fairly cutting it. The proper time for this purpose is, as soon as there is a sufficient length of rowen to cut; and the operation of mowing should be performed very early in the morning, before the sun can have evaporated the dew. The subsequent business varies in no respect from that pursued in making the first crop of hay: less time, however, will suffice; but rowen-hay must be well made and preserved, otherwise it will become mildewed or mouldy, and be rejected by cattle. The hay from the eddish, or after-grass, of water-meadows, is very inferior to that of upland-meadows; the grass, not having had sufficient sun nor time to harden it, is soft and woolly, and has no proof in it: cattle are fond of it, but will not thrive on it. On this account, therefore, it will be advisable to turn neat cattle only into the eddish of water-meadows, as already intimated; and to retain the after-math of other grass-lands for the trying season of spring, when turnips are scarce, and the rowen will prove a most seasonable supply for ewes and lambs.

If after-grass be consumed in the general manner by feeding, shortly after the fields are cleared of hay, or in autumn, its value will be very small (unless in the case of watered meadows) on account of the abundance of food usually prevailing at that season; but if it be kept for ewes and lambs, and other stock, in the depth of winter and the trying season of spring, when food is scarce, it becomes of the greatest value. Tolerable rowen will carry ten ewes and their lambs an acre throughout the month of April, and will then be worth *thirty or forty shillings*; and should the season prove backward, a farmer who is provided with it would not be tempted to dispose of it for a larger sum. The young farmer, therefore, should make as

large a reserve as he can possibly spare for these pressing contingencies.

Having stated in the preceding part of this work the most useful modes of consuming the after-grass, we have only to add a few hints as to the time proper for shutting it up for use during the following winter and spring. This depends on the richness of the soils: lands of moderate fertility should be shut up immediately after they have been mown; but, in fields of greater luxuriance, August is a better month, feeding till then quite bare; and on still richer lands, September may do. On the fine salt-marshes of Lincolnshire, indeed, there is such a spring of grass throughout the winter, that two sheep an acre are fed without any previous exclusion. "This branch of husbandry cannot have too much attention, for it is by far the most certain dependance a man can have for his flock, at the most pinching period of the whole year." *

CHAPTER VII.

ON STACKING HAY.

WITH regard to the STACKING, or *housing* of hay in barns, there is a wide difference of opinion between many eminent agriculturists. In Lancashire, and also in some of the more northern counties, *hay-barns* have been erected on pillars, and covered with slates. The floors of some of them are boarded with loosely-placed planks, perforated with holes, and lying hollow for a certain space above the ground, for the purpose of admitting a free circulation of air beneath. These buildings are cheap, useful, and very convenient in bad weather; and, in those districts where large quantities of hay are made, barns have the advantages of not only considerably less litter and waste, but also a very material saving in thatch; beside which they afford such advantages in preserving hay, as will in a short time amply repay the expense of erecting them. Experience has however

* Farmer's Calendar, p. 451.

proved, that the quality of hay is improved by moderate *sweating in the stack*; in which also it will generally be found to be preserved sweeter than in close barns: but a barn consisting merely of a floor and roof supported by posts, but open at the sides, will be found eminently useful. When these are not employed, rick-cloths and poles should always be used while the stack is forming, in order to preserve it from rain until thatched.

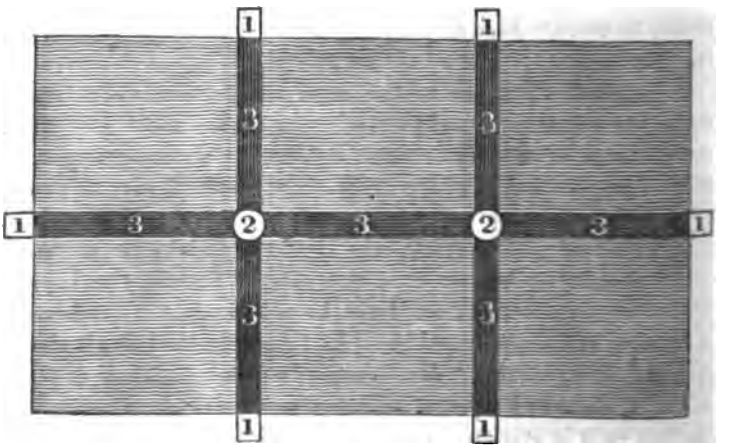
Where the practice of *stacking* hay is adopted, great caution is necessary, that the hay be not put together before it is perfectly dry; otherwise it is liable to ferment, and not unfrequently whole stacks are reduced to ashes for want of due regard to this circumstance. The shape of stacks is a matter of little moment: for farm consumption, indeed, circular stacks are preferable, particularly where straw is scarce. But the square or oblong form is preferable, where straw is no object, as they are not only more convenient in cutting out hay, to form trusses for the market, but also admit the air more fully. The *size* likewise depends on circumstances, and should always be adapted to the quantity of hay: the dimensions most proper for the *staddles*, or stack-bottoms, may in general be from twenty to twenty-four feet in length, by thirteen or fourteen in breadth.

In order to stack hay in the most compact manner, framed stages are commonly made use of: one of the most convenient contrivances of this description is the hay-stacking apparatus of Sir Joseph Banks, which costs about 20*l.** It may be proper to remark, that the hay ought to be well trodden down; and that, in erecting the stack, the middle should be uniformly raised somewhat higher than the sides. Should the hay, by any unforeseen occurrence, have been damaged by sudden or successive rains, and apprehensions be entertained lest it should turn out unprofitably, Mr. Young strongly advises (and his advice is followed by the most eminent agriculturists) to salt the hay as it is stacked; strewing a peck in layers in the stack to a load of hay. It will, he observes, have a very great effect in sweetening it, however bad it may be, *even to blackness:* and experience proves, that every species of cattle will prefer inferior salted hay, which they would not otherwise have touched, to the finest hay without that addition; for the salt, by assi-

* This contrivance is described and illustrated by an engraving in the Annals of Agriculture, Vol. X.

milating with the juices of the hay, prevents too great a degree of fermentation from taking place, and consequently prevents it from taking fire, while it imparts a superior flavour.

In order to prevent hay-stacks from taking fire, the following suggestion for *an improved hay-rick* was communicated to the Board of Agriculture, by A. H. Chambers, Esq. of Stratford-place, London. The idea he acknowledges to have adopted (and certainly with much ingenuity) from the distillers' patent for working during the summer, who make use of a worm through the wash, by which means they keep it at a regular temperature. The application of it only is novel, and was offered by Mr. C. to the consideration of the Board, under a conviction that the present expense of hay-making would be lessened more than 20 per cent. by its adoption. The following ground plans copied from the Communications to the Board, will shew the gutters and channels through which the air passes: being open, the air is constantly circulating through the centre of the rick, so that the dense air is admitted to check the fermentation, and throw off the evaporation more freely.



1. Is the opening of the trench one foot wide, and one foot deep.

2. 2. Are funnels or chimneys to be kept open while the rick is making, and until the heat has subsided, when it may be thatched.

3. 3., &c. Are channels covered with faggots.

A channel or gutter, one foot wide and one foot deep, is cut

through the ground marked out for the rick, and two of these channels are cut across it, which ground is thirteen yards by nine. Two chimneys are introduced like the common hay funnels, with this difference, however, that Mr. C.'s chimneys go full home to the earth; "which being drawn up as the rick is forming, and the channels previously covered with faggots, except where the chimneys are placed, leave them open at all points;" so that, from whatever quarter the wind may blow, the current is uninterrupted.

The advantages stated by Mr. Chambers to result from the use of his contrivance, are various. *First*, The hay may be carried at least one day earlier, by which it is less exposed to the weather: *Secondly*, There is a saving of one day's expense in the labour: *Thirdly*, The weight of the hay is greater; for, if it be made one hour later than is absolutely necessary, it loses so much in weight by evaporation; and it is of the first importance to retain as much sap as possible in the hay, so that it be not heated to injure its colour, being more nutritious. By this means, the exhalations in the summer are not suffered to accumulate, in the same manner as in other hay-ricks, which is one cause of these taking fire. The chimneys are to be kept open until the heat has subsided, as already intimated, when they are thatched over*.

The common practice, for preventing hay-stacks from taking fire, is far less efficacious than the preceding: it consists in making holes, or forming funnels in the middle of them, in order to draw off the superabundant heat; but the advantage thus gained is counterbalanced by the increased degree of moisture attracted by the hay, which is consequently injured. Hence, necessity alone can justify their use, and, in fact, by adopting the precaution of salting the hay, the use of funnels may be altogether dispensed with. As, however, it is of some importance to ascertain the precise degree of heat in the hay-stacks, we know of no method more simple or effectual than that which was practised by the late Mr. Ducket. It consists simply in thrusting a scaffold-bolt, or other stout and long iron bolt into the hay-rick, to give an easy admission to a gun, or ram-rod, furnished at the end with a strong worm. With this

* The utility of the contrivance above described, is not confined to hay-stacks: it is applicable with equal benefit to corn-ricks.

he used to screw out a sample, and thereby discovered not only the heat, but also the colour of the hay; and, if the stack required air, he perforated it in several parts in the like manner, which answered every purpose of a chimney or funnel. Where, however, a hay-rick is discovered to be in a state of fermentation, and the convenience of a ram-rod and screw *cannot* be obtained, (an occurrence which *at present* is not likely to take place,) instead of *throwing down the hay-stack*, which only accelerates the heat into a flame, from the sudden access of air, we would recommend the stack to be gradually taken down, and the exterior layers carefully detached, by which means any sudden inflammation from the current of air will be effectually prevented. When framed staddles are not employed, the ground on which the hay is stacked should be rammed hard with chalk or gravel; furze should then be laid on it, and upon that some old hurdles may be placed, to form a level surface; and by these means, the bottom will be preserved from injury by damp.

CHAPTER VIII.

ON IMPEDIMENTS TO THE SCYTHE, AND THE ERADICATION OF WEEDS.

THERE are various obstructions or impediments that frequently prevent the soils from receiving all the benefit of which they are capable, and which will claim the notice of the industrious farmer.

I. ANT-HILLS, and MOLE-HILLS, are very detrimental to dry pastures, not only by wasting the extent of the soil which they occupy, but also by obstructing the free use of the scythe during the season of mowing. The common mode of removing them consists in dividing them into four parts from the top, and afterwards digging sufficiently deep to take out the core below; so that when the turf is replaced, it may be somewhat lower than

the level of the rest of the land. This will render the spot more moist or wet, and will prevent the ants from returning to their former haunts. In the counties of Herts and Somerset, there is a peculiar sort of spade appropriated to this purpose; the blade of which is extremely sharp, and is so contrived that its whole edge describes three-fourths of a circle. In Essex, the hill is usually cut round with a spade about three inches deep, taken entirely up, and laid with its grassy side downward upon the soil; the ants are then all cleared out of the hole; if any remain, the hole is left open, that the rain may complete their destruction, and the cover which was dug out continues with its mould side upwards for three weeks or a month, till the frost or rain has killed the ants which that also contains, and it is replaced in the socket or hole from whence it was taken; it is then trodden down, and, if necessary, levelled with a roller. Another mode is, to cut off the crown of the hill with the Hertfordshire, or half-moon spade, which is about ten inches in width, and then to dig out the soil, with all the ants, and throw them together around, the clods being first pulverized either by being beaten to pieces or crushed by a heavy bush-harrow. The ants are said to be thus effectually destroyed; and their hills, instead of being a destructive nuisance, are converted into a fertilizing manure*.

In Norfolk, the process, recorded by Mr. Marshall, is as follows:—"With a heart-shaped spade, or shovel, the hills are cut up in irregular lumps, of from ten to fifteen inches in diameter, and from two to six inches thick. The grass sides of these are turned downwards, until the mould side is perfectly dry, when the former is exposed to the air, until the heaps are sufficiently dry to burn. A fire is then kindled by means of brushwood, and kept smothering, by gradually laying on the sods, or lumps, as the fire breaks out, until ten, fifteen, or twenty loads of ashes are raised in one heap. This", Mr. M. observes, "is a cheap way of raising manure, while at the same time it removes a nuisance; and no man, having such an opportunity in his power, ought to neglect at least the making of an experiment. Ashes are, on some soils, an excellent manure; and, perhaps generally, ashes thus raised would be found highly ad-

* Young's Survey of Essex, Vol. II. pp. 97, 98.

vantageous, as a basis, or *bottoming*, for farm-yards and dung-hills."*

With regard to the removal of *mole-hills*, various practices are in use; but the most effectual is that derived from the experience of a successful mole-catcher, and communicated to the public by the late Dr. Darwin, in his "Phytologia". This man commenced his operations before sun-rising, when he carefully watched their situation; and, frequently observing the motion of the earth above their walks, he struck a spade into the ground behind them, cut off their retreat, and then dug them up. As moles usually place their nests at a greater depth in the ground than their common habitations lie, and thus form an elevation, or mole-hill, the next step is to destroy these nests by the spade; after which, the frequented paths are to be distinguished from the bye-roads, for the purpose of setting subterraneous traps. This object may be effected by marking every *new* mole-hill with a slight pressure of the foot, and observing the next day whether a mole has passed over it, and destroyed such mark; and this operation should be repeated two or three mornings successively, but without making the pressure so deep as to alarm the animal, and occasion another passage to be opened. Now the traps are to be set in the frequented paths, and should be made of a hollow, wooden semi-cylinder, each end of which should be furnished with grooved rings, containing two nooses of horse-hair, that are loosely fastened in the centre by means of a peg, and are stretched above the surface of the ground by a bent stick, or strong hoop. As soon as the mole passes half way through one of these nooses, and removes the central peg in its course, the hoop or bent stick rises, in consequence of its elasticity, and of course strangles the mole. The simplicity of this mode of destroying mole-hills and moles, recommends itself to general adoption; as those whose grounds are thus infested may easily extirpate them, or teach the art to their labourers.

Several ploughs have likewise been invented, in different districts, for cutting off ant-hills level with the surface of the field; and are of great utility, as they will perform the work of many men. But whatever method may be adopted for removing such

* Rural Economy of Norfolk, Vol. I.

obstructions, the work ought to be performed in November, during some part of the winter; because, if the places or spots be then left open and exposed, the frost and succeeding rains will exterminate all ants that may be in the lower part of their habitation. A contrary practice, however, has been recommended by some farmers, viz. the destruction of ant-hills in the month of April, on account of the advantage of sowing grass-seeds immediately on the spot; for which purpose a dressing of manure in which chalk has been mixed, is recommended to be thrown over it, as tending greatly to accelerate the growth of the seeds. The hillocks which are cut off should be carried away, and, after being thrown into a heap, mixed for some time with chalk or lime: if well turned three or four times during the summer and autumn, it will make an excellent manure for young grass, as well as a good top-dressing for turnips.

II. Stones are sometimes so firmly fixed in the soil that they cannot be removed without considerable difficulty; but when they are found in a loose state on the surface of the land, and are liable to impede the scythe, they ought to be picked off. This, however, should only be done in a dry season, in the month of March; for, if too many stones be taken away, the land will receive very material injury, especially if it be thin or of a light staple; because they not only prevent the crop from being scorched up during summer, but also the exudations of the earth from evaporating. And in stiff, binding land, they prevent its running together and hardening, and consequently promote vegetation. The injury which soils are exposed to by picking off all the stones, has been clearly ascertained by the late Mr. Macro, an experienced agriculturist of Suffolk, who, suspecting that this practice on his turnip lands had produced more harm than benefit, tried an experiment in the spring, by picking off the stones of one square rod, after the turnips had been folded off, and laying them equally over another square rod by the side of it. He then sowed them with barley, marked them out, and at harvest-time collected their produce separately, as well as that of another contiguous square rod, which had only the natural quantity of stones. The following was the result:—

	qts.	pints.	or per acre. Q.	R.	P.
Produce of the rod that had the double quantity of stones.....	6	1	8	0	2
Ditto from that whence the stones were gathered.....	6	0	7	2	0
Ditto from that in its natural state	6	0½	7	3	1

This experiment coincides with various observations which have been made in several counties, particularly Hertfordshire, and also in France; and although it is more peculiarly applicable to arable, yet the lesson it suggests is worthy of attention in regard to grass-land.

III. WEEDS.—Under this denomination are comprehended all those coarse, rank vegetables, which flourish spontaneously to the injury of other plants, and to the consequent loss of the farmer. As they thrive without care, and even in defiance of efforts made to suppress them, it is evident that they are of a more hardy and vigorous nature than those plants which require the fostering hand of man, and will always be apt to get the superiority, and appropriate to themselves every kind of vegetable aliment. The vegetation of the latter will, therefore, be diminished in proportion to the prevalence of the former: hence it is of the utmost importance to prevent, as far as possible, the production of every kind of vegetable, except those which are designed to be cultivated. Weeds are either *annual*, *biennial*, or *perennial:* the first two die the *first* or *second* year, (whence their name is derived,) as soon as their seeds are perfected; and they are propagated only by their seeds shed on the ground. *Perennial* weeds are such as continue several years, being not only renewed and multiplied by their seeds, but also by their vivacious roots, which lie in the ground during the winter, and put forth new shoots in the spring: and it is to these that grass-land is the most subject.

The seeds of some weeds germinate as soon as they get moisture, and put down their roots into the earth, though they are not in immediate contact with it; others do not succeed unless they adhere to some mellow soil, and enjoy the reviving influence of the atmosphere. But many of these seeds, even those of the most diminutive size, will remain dormant for a very long series of years; and vegetate afterwards, as soon as any accident has placed them in a favourable situation.

Many seeds are accommodated with some kind of wing or feather by which they are conveyed from the place of their birth, and disseminated over the fields. Thus the dock genus have little wings like a bat, by which they are sometimes carried, in a high wind, to a considerable distance; others are surrounded with a light glume or husk, like a mantle; but the buoyant feathers of the sow-thistle (*sonchus arvensis*, L.,) burthistle, (*carduus lanceolatus*, L.,) colts-foot, (*tussilago*,) and other weeds of the same class, bear them to the most remote places.

The vivacious roots of weeds are, some branched, some entire, some perpendicular, some inclining, some fibrous, some tuberous, some creeping, jointed, &c. All of them have the power of putting forth new plants from different parts. Some of these roots extend no further than the cultivated soil; others penetrate much deeper, and stretch their ramifications in the inferior strata to a considerable length.

From the different characters of those plants which we call weeds, it is obvious that different means of extirpating them are required. Annual and biennial plants are destroyed by pulling them up by the roots, or by cutting the stem under the lowest or first formed leaves; and after they have begun to flower, by cutting them over any where below the lowest branches. But those plants having been propagated by former ones of the same species shedding their seeds, and many of those seeds still lying dormant, the soil is not freed of the incumbrance by destroying the plants of one year.

Vivacious roots cannot be destroyed except by turning them fully out of the ground, and either carrying them off, or exposing them to the air, till they be dried and incapable of vegetating. But as this can only be effected by the plough, they cannot be fully eradicated out of grass-land, and therefore can only be checked. As roots are fed and supported by leaves, those roots are discouraged by repeatedly depriving them of their leaves and stems. The cutting them half through the stems, about the middle of June, or when the weeds are in full vigour, and before they generally shed their seed, will tend greatly to diminish their future growth; for the sudden interruption in the circulation of the sap causes the latter to stagnate in the roots, and consequently the weeds perish.

The preceding remarks apply chiefly to annual and biennial weeds: with regard to *perennials*, a summer fallow is the only

remedy, when once they have been allowed to take possession of the soil. It sometimes, indeed, happens that pastures are so over-run with large weeds as scarcely to afford a mouthful of wholesome food to the animals feeding in them; yet, some of these may be eradicated by hand, and therefore demand a distinct consideration: these are, 1. the common dock; 2. thistles; 3. ragweed, or ragwort; and 4. coltsfoot.

1. The *Common Dock* is too well known to require any description: it is a most troublesome plant, especially in clayey soils, where it is always most frequent. Every bit of its long tap-root, if left in the ground, will form a new stem. It should be fully turned out with the dock-iron as soon as the flowering stem is formed; and as the plants of this genus rise at two seasons, the fields should be weeded twice in the summer, in order that no seeds may be allowed to ripen. The roots should be fully exposed to drought; for if they lie in a moist place, they will continue to vegetate on the surface, and strike outside roots into the ground. Mr. Kerr, the intelligent reporter of the Berwickshire husbandry, recommends that docks be *pulled up by the hand after heavy rains*, when the soil is soft enough to allow their long tap-roots to be easily pulled without breaking, and before their seeds approach to ripeness.

2. Of *Thistles* there are several kinds, but the most noxious are the *bur-thistle*, the *corn-thistle*, or corn saw-wort, and the *sow-thistle*. The bur-thistle, being a biennial plant, may be killed at any time by cutting it under the first leaves. But the corn and sow thistles, which are perennials, and extend their vivacious roots beyond the reach of the plough, are more difficult to eradicate. They are usually cut down by means of a well-known implement, called a Thistle-extirpator; the structure and effective utility of which, having been lately improved by Mr. Baker, of Westcoker, near Yeovil, Somerset, we have delineated it in the following figure:—

A is the handle; B the claws between which the thistle is received: the curved iron C, is the fulcrum, over which the purchase is obtained for extracting the root. D is an iron rod or bar upon which the foot is placed to thrust the claws into the ground. In case the root of the weed breaks, while endeavouring to extract it, the curved blade E, which has a sharp end like a chisel, is thrust into the ground, in order to cut off the root of the thistle some inches below the surface, and thus prevents it from vegetating. It is in the addition of this curved blade that Mr. Baker's improvement consists, for which the Society of Arts, &c. in 1810, conferred upon him their gold medal.

If thistles be cut down in rainy weather, or if much rain fall soon after, the water descending into the fresh wound of the stem (where they are cut in the ordinary way) debilitates the roots, and prevents the growth of the plants for a time. But if such critical rains do not occur, fresh leaves will immediately arise to support the roots, and the cutting will produce very little effect. They should, therefore, be annually pulled up, as soon as possible after the flower begins to form, taking advantage of the first shower that happens to fall, to soften the ground and make them draw freely. By pursuing this practice regularly for several years, the deep-lying perennial roots will become gradually weakened, and fall into decay.

3. *Ragweed*, or *Ragwort*, as it is also termed, not being deeply rooted, is best extirpated by the hand: cutting it down will be of little service, for, though some of the plants die, many survive and branch out more copiously the following

year. They may easily be pulled up when in flower, if the ground be soft at the same time*.

4. *Coltsfoot* is, of all perennial weeds, the most vexatious to the farmer, whose utmost vigilance it will frequently elude, not only because its seeds come to maturity before the leaves expand, but also from the seeds ripening so early in the spring.

The months of September and October are considered as the best time for cutting down coltsfoot; at which season the plants are at their full growth, and easily discovered. The method then to be used, is, to pull up and carry off every root that can be laid hold of; and it will be observed, by inspecting the roots about an inch below the surface, that a number of buds, about the size of a pea, spring from that part of the root, which flowering afterwards, produce fresh seed. Now, if these be allowed to stand until the next spring, they will flower and shed their seeds, in spite of every possible attention, the flowers coming out early in April, according to the season; so that it is impracticable to prevent their increase by any other method than the one suggested. If this plan, however, be persevered in for a few years, the success is indisputable; though much depends upon performing the operation of pulling before the leaves wither and fall off, after which the roots cannot be easily discovered. If the weather be moist, there will be little difficulty in pulling up the roots to a sufficient depth; but should it be dry, or the ground hard, it is proper to furnish the pullers with a small piece of iron split at one end, like the toes of a hammer, and about ten inches long†, to enable them to get the root up to the required depth. A few boys or girls, under the direction of a careful overseer, will execute this work at a trifling expense; and care must be taken that all the roots, so pulled, be carried off and destroyed; for, if allowed to remain on the sides of stone walls or hedges, they will flower in the succeeding spring, and shed their seeds; which, being of a winged description, will fly about the field in all directions. Where land is much infested with this pernicious weed, it is proper to examine it in the spring months, lest any of the stalks should have escaped in autumn; and in this way, by attention and perseverance, ultimate success may be relied on.

* Naismith's Elements of Agriculture, p. 406.

† Mr. Baker's weed-extirpator, above described, might probably be employed with success, instead of this implement.

It would greatly exceed our limits, were we to enumerate other weeds which annoy the farmer; as the preceding are the most formidable and vexatious impediments to his labour, we have confined our attention to them. And, with respect to all other inesculent herbage growing on pasture grounds, as well as all weeds bearing winged seeds by the sides of roads, ditches, &c. we would remark, that they should invariably be cut down as soon as they begin to flower, in order to prevent their increase by their seeds being dispersed over the fields.

CHAPTER IX.

ON PARING AND BURNING.

THE *paring* of land is a practice of long standing in this island, particularly in the West of England, where it is also denominated (in conjunction with *burning*) *den-shiring*, *burn-bailing*, or *sod-burning*. It consists in cutting or paring off the turf or surface of the ground, and piling it in heaps to dry; which are afterwards kindled and burnt to ashes, that are spread over the surface and ploughed in. The best time for this purpose is, from the latter end of February, throughout March, if the north-east wind prevail, to the end of May. It is proper to employ several hands in the burning, at one time, in order that a dry season may be obtained, in case the season should in general prove wet. The ashes should be spread before the plough, and turned in immediately. By breaking up old grass, or saintfoin lays, in this manner, they are brought into order for turnips with only one ploughing; so that not only much expense and tillage are thus saved, but also the destructive turnip-fly never attacks turnip crops on burnt lands,—a circumstance of no inconsiderable importance, especially as turnips are generally a crop that amply repays the expense of the operation.

This operation is performed on different soils with different implements. Thus, in *old pastures*, or *meadows*, the breast-plough is an effective implement, its thighs being armed with wooden guards. From one inch to one inch and a half is the usual depth; though two inches in depth is preferable, in the

opinion of some agriculturists, on account of the greater quantity of ashes thus produced. It should, however, be observed, that the burning will be more certain, in case of unfavourable weather, the thinner the soil is pared. The expense of paring such land (including the burning of it and spreading the ashes) fluctuates from 1*l.* 5*s.* to 2*l.* per acre. In *fenny* or *boggy* situations, for instance those in the county of Cambridge, a useful implement, denominated the *paring plough*, may be employed; it turns off a furrow from twelve to sixteen, and even eighteen inches in breadth, and not exceeding one inch in depth. By using this instrument, the cost of paring, burning, and spreading the ashes is reduced to nine or ten shillings per acre; but it is calculated only for such soils as have been in a state of cultivation: for stiff lands, a strong plough, in use in the county of Chester, has been much recommended. The manner of piling the sods is likewise various in different districts; but, in general, it should be remarked, that the operation of burning will be most effectually performed by piling the parings into small cocks, or heaps, similar to those made in hay-fields, placing the grass sods downwards for the admission of air, and leaving apertures both at the top and at the bottom of each heap; but these apertures should afterwards be closed up with fresh sods, in order that the burning may be properly completed.

There is, however, a difference of opinion on the propriety and impropriety of paring and burning land, among agriculturists. By some it is pronounced to be a wasteful, extravagant operation, which dissipates what should be retained, annihilates oils and mucilage, calcines salts, and reduces fertile organic matter into ashes of very weak efficacy; and that the vegetable particles, which are brought into play at once for the production of a single crop, might, by less desperate management, be husbanded to the support of many *. Such is the opinion of several eminent agriculturists; but their sentiments are strongly controverted by others equally experienced in the various departments of Rural Economy. By the advocates for paring and burning it is asserted, that the objections are not founded on sound reasoning and philosophical theory; that the most decided practice, and most extensive experience, pronounce this system to be an admirable one; and that the mis-

* Farmer's Calendar, p. 171.

chiefs and disadvantages, stated as thence resulting, are chiefly attributable to the *abuse* of the method, and by no means necessarily connected with it. With this last opinion we cordially coincide: for the vast crops of corn obtained from soils that have been pared and burnt, prove incontestibly that the soil is not deteriorated, and that the inconveniences above detailed, as consequent on this system, are not rationally founded or supported. It is in fact the only mode of bringing sour uncultivated land, that is covered with ling and weeds, into cultivation without more expense than it is generally worth.

The operation of paring and burning may be advantageously performed on *heaths* and *downs* which have a thin, weak, and loamy sand, with a calcareous bottom; of such land considerable tracts have been broken up from a state of nature, on Newmarket Heath, at an expense of 1*l.* 16*s.* per acre. Immense crops have been obtained; but from the very bad course afterwards adopted in taking successive crops of grain, the land has become exhausted, and thus the system has been unjustly brought into disrepute. The lands thus treated are generally of the very worst kind; and were they of the best, they could not support such injudicious management. The chief object of paring is to get rid of coarse herbage and perennial weeds, which, by the process of burning, are converted into a stimulating manure that will force a few heavy crops, but must then necessarily leave the soil impoverished. The most approved method for ground intended to be relaid to pasture is, to take only two successive crops of turnips, or tares, turnips, and cole fed off, and then to lay the land down with grass seeds; but as few farmers will forego the immediate profit of a corn crop, in that case only one such crop should be taken, and the seeds should be sown along with it; taking especial care to have the ground brought previously into very fine tilth, and to pay great attention to hand-weeding and rolling.

Moory, fenny, and *boggy,* or *peaty* soils derive very essential benefit from this practice, which is therefore adopted in almost every part of the kingdom, it being scarcely possible to reclaim ground of this description without the aid of fire, which most effectually destroys spontaneous growth, and only fails when the labourers do not pare to a sufficient depth. *Chalk lands* also are greatly improved by paring and burning; so likewise are

loams, though some agricultural friends to this system have objected to employing it on such lands.

Lastly, *clayey soils* may be advantageously pared and burnt; for not only does it add salts to the land, which the burning of grass roots produces, but also opens part of the stratum of clay next the soil so much, that the roots of vegetables can afterwards feed therein. One objection to this practice, however, ought not to be concealed, viz. that what is properly *soil* is thus converted into masses of infertile brick; for the chief parts of the heaps are composed of *ashes*, properly so called, and though the remaining masses are of the description above noticed, yet these are so far from being a nuisance, that they tend to loosen and open the stubborn adhesion of stiff, tenacious clays, and thus form an excellent addition to the soil*. On such land, however, the practice is not to be recommended, for it requires great judgement in the execution; and, if carried too far, may destroy much valuable soil without commensurate benefit to the remainder.

Upon the whole, then, it appears that the paring and burning of land may be beneficially resorted to on moist soils, provided it be conducted with caution; the ashes be spread as speedily and uniformly as possible over the surface, and especial care be taken not to exhaust it by repeated crops of corn when it is intended to be again laid down to grass.

CHAPTER X.

ON DRAINING.

Few operations are more important in the improvement of land than that of draining; for, though vegetation cannot proceed without an ample supply of water, yet there are cases where there is such a superabundance of that element, as to be productive of the most injurious consequences to the growth of

* Farmer's Calendar, p. 176.

plants, rendering the herbage coarse and proportionately inadequate to the proper support of cattle fed on such pastures, as well as dangerous to their health.

It is, therefore, of the utmost importance to the farmer, that he duly consider the cause of the excess of moisture, which is thus prejudicial to his interest, and to rectify it accordingly. Various methods of draining have been suggested by ingenious men, which are applicable to various soils. If the land be not marked by any strong inequalities of surface, and the wetness proceed from the texture of the soil, particularly the sub-stratum, the system of hollow draining, applied to the whole surface, is, perhaps, the best cure the evil will admit. On the contrary, where the land is situated on a declivity, springs break out on the slope, which greatly damage the land below; in this case, a different system of management must be adopted, as the common methods of draining are rarely adequate. In discussing this important branch of rural economy, therefore, we shall first state the various methods of draining, applicable to lands of the first description, and then proceed to notice that system, or plan, which is best calculated for those last noticed, viz. uplands.

With regard to lands which are not marked by any striking inequalities of surface, in the counties of Essex and Herts, (which contain many districts of this nature,) the method of cure resorted to is *hollow-draining*, or *land-ditching*, as it is sometimes termed. It consists in digging main and side drains, like those commonly made in draining land; the depth of the main drain varies from twenty-two to twenty-four inches. That of the side drains from twenty to twenty-two inches. The soil is first ploughed; and the length to which the main drains may be continued without a vent, depends on the situation of the land. If it has a gentle slope, it will be proper to carry off as much water as possible by means of side drains; sometimes, however, the surface of the ground is unequal, in which case it becomes necessary to form additional main drains.

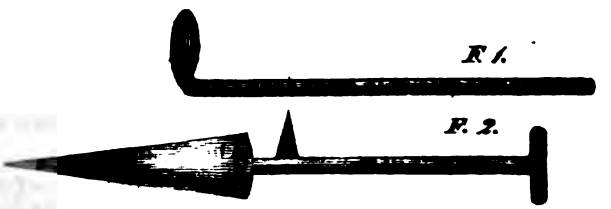
The length of the side drains depends on the greater or less elevation of the soil: in general, one rod is a sufficient interval between each; but in very porous or loose grounds, they may be made one rod and a half asunder. The trenches being cut of a sufficient depth, they may be filled up with stones or with brush-wood, bones, straw, fern, heath, &c., and the surface

earth laid on *archwise*. In making drains of this kind, the chief object, in the opinion of the most experienced drainers, is not durability of the materials, but the proper *arching* of the earth, which will remain perfect when the other materials are decayed. In several parts of Essex there are drains thus made, which run very well, although they were filled only with straw upwards of forty years since. The expense is stated to be about 3*l.* per acre. As those hollow drains continue longest serviceable which have a good fall, it will be adviseable in all cases not to be sparing in giving a fall whenever circumstances will admit of it. But as straw will eventually rot, and in that case becomes a receptacle for breeding worms, which incites moles to work much where it is, Mr. Naismith recommends boughs of pine to be laid in the conduits or drains, in order to prevent them from being choked; as moles are said to shun substances containing resin *.

Sod or earth drains are usually dug to the depth of two feet with a spade, after which the earth is removed by means of a scoop, about four inches in width; and the drain is covered with the soil first taken out, if the ground be sufficiently firm to sustain their weight; if not, some black-thorn bushes are put in for that purpose.

Another method of making common earth-drains consists in digging two or three spits deep with a broad spade, and excavating the bottom with a narrow one, after which the drain is filled with stones.

Or, a furrow may be drawn with a plough, and cleared with a common spade; the draining implement, delineated in the annexed fig. 1, is then to be introduced to the depth of one



foot and a half from the surface; and the loose mould to be removed by the scoop, represented in fig. 2: along the bottom

* Elements of Agriculture, p. 311.

should be laid heath, or black-thorn bushes, covered with strong wheat straw, closely twisted to the thickness of a man's leg; after which the whole is to be carefully closed in.

In all cases, the apertures or mouths of drains ought to be effectually guarded by a railing, or grating, to prevent the water-course from being obstructed by the treading of cattle attempting to drink at it. And the passage for the water at the bottom should uniformly be narrow, as the force of the water will be fully adequate to remove any accidental impediments to its course, and consequently such drains will be more durable.

Where the common methods of draining cannot be adopted, *stone drains* may be resorted to with advantage. They should be cut ten or twelve inches wide, with perpendicular sides; and flat stones be so disposed as to leave a water-course at the bottom, by setting two stones in such a manner as to meet triangularly at the points. Or flat stones may be placed along the bottom, and three others placed upright, and the water left to work itself a passage between them. At all events, the cavity of the drain should be filled nearly up to the top with loose stones, for which screened gravel may be advantageously substituted, where a sufficient quantity can be commanded. The principal drains ought to be three feet in depth, by one foot and a half in width; the top and bottom laid with flag stones; the sides raised, or built up to a sufficient height with common stones; the whole being covered with sods of turf, with the sward or grassy side downwards, and over these is to be spread sufficient earth to admit the plough; or, on meadow-land, other sods with the grass upwards. In general, the smaller drains are to be conducted into the main trenches at an acute angle.

A peculiar mode of draining land with chalk, as a substitute for stones, has been successfully practised in some parts of Yorkshire. The trenches are cut in the common manner, and then filled with pieces of chalk; on these is laid a thick bed, or layer, of evergreen boughs, which again are covered with the sod or earth. The extremities of the main drains are arched to a short distance with brick-work, to preserve the chalk from the effects of frost, which will otherwise reduce it to powder, and, of course, injure the drain. By using chalk in this way,

the growth of moss is effectually prevented, and a free current obtained for carrying off the water.

In the preceding methods of draining, and indeed in every other mode that may be adopted, it ought to be constantly understood that, where there is a declivity in the field, the drains should have a very gentle descent, lest the water, by a quick current, should hollow the earth, and make itself new channels. On the contrary the moister and flatter a wet field is, the more in number, as well as larger, should the drains be made: in fact, they should, in every case, be proportioned to the quantity of water to be discharged, the smaller opening into the larger. Particular care ought also to be taken that the drains be of an equal depth, in order that water may in no place stagnate and putrefy, and that furrows be made to carry the water every where into the ditches: precautions these, which become peculiarly necessary where large quantities of snow are dissolved in the spring, or the place is subject to inundation.

Further, with regard to the draining of bogs or marshes, where a sufficient fall can be procured, the first object is to ascertain the lowest spot of dry ground that surrounds it, in order to open on that part of the main trench which is to carry off the water; and if there be any trace of a current, or stream, this should be followed with the greatest care, as it may serve to point out the precise spot on which to begin. The main trench, beginning at the lowest part, may be carried on to any distance required; if it commence at the proper spot, ten acres may be detached from the marsh, whatever its extent may be, and perfectly drained. The main cut, or trench, ought to be ten feet broad in the clear, with a proper slope, in order to prevent the sides from falling in and filling it up.

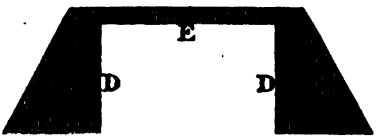
It has been intimated, in the preceding chapter, that bogs are divided into two parts, black and red, according to the substances that enter into their composition. The red sort is altogether unfit for the purposes of fuel; but the black sort is solid, and affords excellent fuel for domestic purposes. In digging bogs of the last-mentioned description, therefore, the soil taken out of the drains ought to be cut into turfs, and dried for use.

In proportion as the main canal advances, small ones may be cut into it on either side; the depth of the former must be

regulated by circumstances; but the cross cuts should be at least four feet broad at the top, by three feet in depth. In the succeeding spring it will be necessary to open and deepen them, and clear them from any matters that may have casually fallen in;—this work, indeed, should be occasionally renewed. During the second year, the main trench should be extended; fresh inclosures may also be then formed by making fresh lateral cuts, and these may be drained by means of small cross drains. The advantage resulting from this mode of draining, though it be necessarily laborious and expensive, is very considerable; for, by the operation being thus gradually completed, the labour in succeeding years will be greatly reduced, in proportion as the bog subsides.

Where no fall can be procured, the water may, in many situations, be collected by cutting a long, horizontal ditch above the level of the marsh, so as to intercept all the wall springs; after which the water may be carried off in wooden troughs, or hollow bricks, above the surface; and in case water should continue to penetrate the morass, it may be conducted to the extremity of the ground, either in open drains, or in covered brick drains, represented in the annexed figure,

which describes a hollow brick, two of which (one being placed upon the other) form a pipe, or tube, which is chiefly useful in making small drains. Or thus,



D D are two bricks placed opposite each other, and then covered with a stone on the top, marked E, in which situation they will form a large drain; such bricks being kept firm and steady by the mould pressing on their sides. When these drains are sunk sufficiently low to admit of a proper depth of soil being laid over them, the sward should be carefully pared off before

the trench is opened, and relaid as it is filled up; by which means the pasture will not be injured.

In a former section we have noticed the various implements that are employed for the purpose of draining land. In draining low lands, however, these ploughs may be advantageously superseded, in some cases, by the use of the cast-iron *roller*, or *wheel*. It weighs about four hundred weight, and is four feet in diameter. The cutting edge, or extreme circumference of the wheel is half an inch thick; it increases in thickness towards the nave, or centre, and will cut a drain half an inch wide at the bottom, increasing gradually to the width of four inches at the top, and about fifteen inches deep. This wheel may be so placed in a frame, that it may be loaded at pleasure, in order to penetrate to a greater or less depth, according to the resistance of the ground; which being thus cut in the winter, the tracks of the wheel may then be filled with twisted straw, and lightly covered over, or left to crack wider and deeper in the course of the following summer; when such clefts, or cracks, ought to be kept open with twisted straw, and covered over as above mentioned with light, porous earth. Hollow drains of this description are peculiarly calculated for grass lands, at a comparatively small expense, and will answer every useful purpose.

Sheep pastures may be drained of the superfluous surface-water, by means of a strong common plough, in the following simple manner:—After turning up furrows through the hollow parts of the field, where the water is apt to stagnate, let a man pare off the loose soil with a spade, leaving the inverted, or grassy soil, about three inches thick; after which let him turn the sod over into the furrow, with the sward or grass side uppermost. Thus a canal of three or four inches will be left at the bottom of the furrow, sufficient to discharge a considerable quantity of water, which will readily subside into it.

It sometimes happens, however, that clayey soils are so loaded with water, that various drain-ploughs prove of little service, from the injury sustained by the soil from *poaching* by the feet of cattle. To supply this deficiency, and remove this inconvenience, it has been suggested by Mr. J. Middleton, to add a piece of wood to the felly of a common six-inch cart-wheel, to which is prefixed a triangular rim of iron *, the cost of

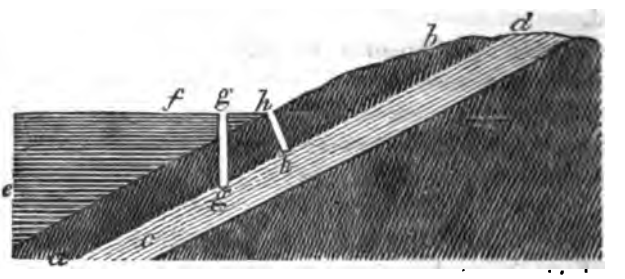
* Middleton in Commercial and Agricultural Mag. No. XXII.

which simple addition will not exceed one guinea. A wheel of the description just mentioned, when put on the axle of a cart in the usual way, will consequently rest on the triangular iron rim; and on driving the horses forward, will, by its revolution, make a small indentation in the soil. In order to press it down to the depth of six or eight inches, the side of the cart next such wheel ought to be laden with iron, stones, or other heavy substances, until the rim and additional piece of wood (and likewise the felly, if necessary) sink into the soil. The cart ought now to be drawn in such a direction that the cutting wheel may revolve where it is intended to form the drains. Mr. M. states that it will sometimes be requisite to draw such wheel through every furrow; though, in the case of level land, it should be drawn over the latter in parallel lines, five or ten yards distant from each other. Of course, the wheel on the opposite side of the axle, which likewise is a common six-inch wheel, will support only the empty side of the cart, and will not cut the ground.

In the draining of uplands, or those lands which are situated so high that the water can flow off from them, if it be properly collected and conducted, a different system prevails; of which, though our limits forbid us to specify every various situation possible, it is attempted to convey some idea in the following outline.

In lands of this description it generally happens that the waters from the springs beneath the soil are impeded in their current towards the rivers in their vicinity. The springs in question have been found to originate from the moisture of the surrounding atmosphere; which, being condensed into water on the summit of eminences, in consequence of the increased degree of cold prevailing in such situations, penetrates the various strata of the incumbent porous soil. The water thus formed continues to descend, sometimes for several successive miles, though in general from the nearest hills, into the adjacent valley, till, its course being intercepted by a bed of clay, it accumulates in considerable quantities; being thus forced to work its way through the porous strata of gravel, stones, rock, or sand, &c. incumbent on the clay, it follows their course or *dip* till they approach the surface of the earth, or are impeded by any obstacle, which causes the water to rise upwards to the surface, and thus produces fens, bogs, springs, &c.

At the foot of eminences then, where too great a degree of moisture prevails, the ground should be perforated with an auger, in order to ascertain the depth of the latent springs, and of course the thickness of the upper bed or layer of soil. Should this not exceed four or six feet, an horizontal ditch ought to be cut along the foot of the hill, in order to intercept the water, which should be carried off by one or more trenches communicating with such horizontal ditch, and conducting the body of water thus formed into the nearest rivulet. And, as the strata or layers, through which the water penetrates in forming such springs, have in general the same inclination or *dip* as the surface of the eminence, the auger-holes ought to be perforated, and the ditch cut *perpendicularly to that surface*, and not vertically downwards, as is usual in the common practice: by pursuing this mode, the arrival at the second stratum will be greatly facilitated, as the annexed figure will, we trust, render sufficiently plain.



In this figure, the letters *a b* represent the upper stratum, which may be supposed of marl; *c d* the second stratum, for instance, of sand; *e f* the earth accumulated in the valley. The letters *g g* illustrate the manner of boring the holes perpendicularly to the side of the mountain, and not perpendicularly to the horizon, as at *h h*; from which it is obvious that, in penetrating the upper stratum in order to ascertain that beneath it, the former method *g g* is much shorter, and consequently more effectual than the latter, *h h*.

Should it however happen, that on cutting a ditch five or six feet deep, along the foot of a hill, vertically to the rising plain, the upper stratum be not cut or penetrated, and of course no water ooze into the bottom of such ditch, other holes must be perforated in the bed of the latter, to the depth of some yards, or till some water appear. In case this expedient succeeds,

several holes ought to be bored, and the water thence arising should be conducted into the neighbouring brook, or rivulet; as it will now rise, collect in those ditches six feet below the wet surface of the valley, and thus be completely carried off.

In proportion as the ditches above mentioned descend, they should be made narrower by means of spades calculated for this purpose; the lowest part being contracted more than any other, not only because such narrow channel gives the water a more rapid current, but also in order that its shoulders or edges may support stones, or faggots, for covering the drain at a small expense, without affecting or impeding the current of water. Hollow bricks, ridge tiles, or fragments of plastered floors, may be chiefly substituted for stones, pebbles, or faggots.

For draining a hill, composed of alternate beds of rocks and clay, it will be necessary to make different drains across, through the wet ground, and at different heights, to communicate with a drain from the upper wet ground. The removal of superfluous moisture from soils that are porous above and retentive below, may be effected by making a large drain in the most convenient place, and cleaning the *furs* well, to serve instead of smaller ones.

The system of draining uplands, above detailed, is that pursued by Mr. Elkington, whom the Board of Agriculture honoured with a liberal premium for communicating his *discovery* to the public; although the priority of such discovery was claimed by the late Dr. James Anderson, who is asserted to have published an account of it ten years before. From a consideration of the various circumstances, it will be seen that draining depends upon three points:—

1. Upon finding the main spring, or cause of the injury the land sustains, without which nothing effectual can be done.
2. Upon taking the level of that spring, and ascertaining its subterranean bearing; for, if a drain be cut a yard below the line of the spring, the water thence issuing cannot be reached; but by ascertaining that line by means of levelling, the spring can be cut off effectually, and consequently the land will be drained in the cheapest and most complete manner.
3. By making use of the auger, to reach or *tap* the spring, and give vent to the water thus confined, when the depth of the drain does not reach it; where the level of the out-

let will not admit of its being cut to that depth, and where the expense of cutting so deep would not only be very great, but the execution of it accompanied with very considerable difficulty.

Sometimes, however, situations occur, in which the first stratum of earth is too thick to be easily pierced by the auger; or, where the water, condensed in the manner already stated, may work its passage between the second, third, or fourth strata, forming the sides of the hills from a deficiency of so many of their strata at the summits. Consequently the water, being confined by the substances which form the plain of the valley, ascends through them to the surface, and thereby forms marshes and bogs; but this inconvenience may be successfully obviated, by adopting the common method of draining.

Lastly, when the drains have rendered the marshes sufficiently firm to allow cattle to walk on them, the heaviest rollers that can be obtained should be drawn repeatedly over them during the first year, in order to consolidate them effectually. Previously to rolling in the spring, it has been recommended to sow every kind of grass-seeds adapted to the soil indiscriminately on the land, and, in such case, bush-harrowing should never be omitted.

In the course of the preceding details on draining uplands, frequent mention has been made of the *auger*, an effective implement for most common purposes; but as peat, when perforated with this instrument, is apt to close, by being pressed only in a *lateral* direction, *without being cut*, the current of water is liable to be again impeded, and consequently the work is rendered ineffectual. To obviate such inconveniences, a useful implement has been communicated to the public by Thomas Eccleston, Esq.* of Scaresbrick Hall, in the county of Lancaster, of which the annexed figure will afford an idea.

A is the cutter of the *peat borer*, (for such is the name of Mr. E's contrivance,) which penetrates the peat.

* In the Transactions of the Society for the Encouragement of Arts, &c. Vol. XIX.

B, the body of the borer, which is six inches in diameter.

C represents the opening through which the peat, introduced by boring, is extracted from the ground.

D describes part of the iron bar of the peat-borer, to the upper part of which a cross handle is to be attached.

By means of this machine, a cylindrical column of peat, six inches in diameter, will be effectually cut out and removed, and thus afford a free passage to the water. Thus the trouble and expense of draining marshy land may be considerably reduced; and it will at length become so firm, that the first drains will continue uninjured. In his communication to the Society for the Encouragement of Arts, Mr. Eccleston states, that the situation of the soil must regulate the proper depth to which the peat-borer ought to descend. Where moss lands are very low, and liable to inundation, it will be proper to penetrate only sufficiently deep to drain the surface, as deep boring would cause it to sink so exceedingly low as to be overflowed by every sudden shower of rain.

Before the subject of draining is dismissed, it may not be altogether unnecessary to notice a fact relative to the obstructions to which drains are liable, either from stones or earth falling into them from the sides, but more particularly from the growth of the marsh horse-tail; an aquatic vegetable, that has been discovered growing within drains to a very considerable extent, and which it has at length completely choked up. For the following remarks on the effects produced by that plant on drains, we are indebted to a communication by the late Sir Joseph Banks to the Board of Agriculture.

At the Duke of Bedford's seat, at Woburn, Bedfordshire, some bogs, drained by under drains, made at a great expense, appeared at first perfectly dry, but were afterwards found to become gradually less so. On examination, these drains were found more or less choked by a plant vegetating *within them*, and forming both stems and roots, the whole several yards in length, intercepting the course of the water, weakening the current by degrees, and at last wholly choking up or obstructing the drain. This plant is the *Equisetum palustre*, a weed common in moorish and swampy ground, though little noticed by naturalists. Its root, or rather its stem, under ground, is a yard or upwards in length, and in size like a packthread; from this a root of twice the size of the stem runs

horizontally in the ground, taking its origin from a lower root, which strikes perpendicularly downwards, and which Sir Joseph Banks says, he has been able to trace as thick as a small finger. This root forms, in some places, beds which occupy a large portion of the more solid spots of a peaty bog, as might be seen in some parts of the banks of the Duke's open drains. As the bud, by which the plant appears to renew itself in the spring, is situated on the horizontal root, a yard or more in depth, the shoot must, in its progress upwards, be liable to meet with under drains, and penetrate into them, through the openings left for the passage of the water. When once entered, nature has given the plant powers of piercing the soil upwards, and to enable it to vegetate in the atmosphere of a drain. The evil, if known, Sir Joseph Banks thinks, may be removed by casting the under drains into open ones *.

CHAPTER XI.

ON IRRIGATION.

WATER, forming by far the greatest portion of the sap of plants, is absolutely necessary to vegetation: hence, although this fluid is very injurious to land when it soaks into or stagnates upon it, yet it makes a very great improvement upon land that is flooded with it, where there is plenty of running water that can be conveyed upon the land, and drawn off thence at pleasure †. Thus, suppose there is a piece of ground lying contiguous to, and somewhat lower than the river; some water being conveyed from the river to the higher parts

* Communications to the Board of Agriculture, Vol. II.

† When land has been covered by water in the winter, or in the beginning of spring, the moisture that has penetrated deeply into the soil, and even the sub-soil, becomes a source of nourishment to the roots of the plant in the summer, and prevents those bad effects which often happen in lands in their natural state, from a long continuance of dry weather. Sir H. Davy's Lectures on Agricultural Chemistry, p. 351.

of the land, will shew where a carrier is to be cut, for conducting the water from the river to such higher places. These carriers, or carriages, as they are respectively termed, being filled till they run over throughout their whole length, drains are to be made in the lowest parts of the meadow, as nearly parallel to the carriages as possible. The design of these drains is to discharge the water into a large or main drain, which conveys it off the meadow.

In order to make the water run equally over the sides of the carriage, there are stops made in it at proper distances, by which the course of the water being obstructed, it rises a little and runs over the sides of the carriage. These stops are made with pieces of turf laid across the carriage, as high as the banks of it, next the sides, and lower towards the middle of it; which stops being of a proper height and distance from each other, (such height and distance to be determined by trials,) the water will uniformly flow over all parts of the banks of the carriage.

These carriages should be made with a small ascent in the bottoms of them, from the river to the further end, and should all unite near the river, where a sluice is to be placed with gates or hatches; which being shut, to keep back the water coming from the river, and a small sluice in the side communicating with the main drain of the canal, opened at the same time, the water in all the carriages, or canals, will then return from the further end of the carriages, and, passing through this small sluice into the main drain, the carriages will thus in a short time be laid perfectly dry. The bottoms of the drains are, on the contrary, to be made highest next the river, and from thence deepening to a large drain at the lower end of the meadow; so that when the water ceases to run into them over the sides of the carriage, they will soon be emptied into the main drain, and thus the whole meadow will be laid dry.

When the meadow is to be watered again, the small sluice is to be shut, and the large one opened, which will admit the water from the river, and irrigate the meadow as before. The water should flow over the sides of the carriages, and over all the surface of the land lying between them and the drains, as equally as possible; and for this purpose, the earth dug out of the drains and carriages at first, and afterwards when they are scoured or cleansed, is to be laid upon the lower part of the

ground, so that it may lie even and upon a regular descent to the carriages or drains. The soil thus dug or scoured out, also serves to repair the banks of the carriages.

Though the water flows equally over the surface of a water-meadow, the grass does not grow equally; but the crop is greatest towards the carriages, more of the rich sediment being deposited there than towards the drains; hence it is that the produce is greater where the carriages and drains are near together. The more numerous these are, the larger will the crops be, provided a sufficient proportion of water can be obtained.

The constructing of sluices is one of the principal articles of expense, partly because they are usually made of timber, a material which is subject to decay in the compass of a few years, whereas brick and stone, cemented with terras, are equally proper and infinitely more durable; particularly when the sluices are constructed upon correct principles, so as to prevent them from being *blown up*, or the water from forcing a passage at the bottom;—a circumstance which, when it happens, often renders it necessary to re-build the sluices. It would be foreign to the plan and design of this work to detail the mode of constructing the sluices, stops, &c. necessary in the system of flooding land; we shall, therefore, at present only observe, that the different works ought to be carefully examined and scoured out in autumn, and all necessary repairs made, and refer the reader to Mr. Boswell's very interesting "Treatise on watering Meadows."

The preceding hints have been given on the supposition that the land is perfectly level: but where its surface is very uneven, the inequalities should be removed, though the expense be considerable, as the improvement will more than counterbalance the expense. A striking illustration of this remark occurred some years since in a small coarse meadow, which consisted chiefly of a peat soil, and out of which the peat had, in some places, been dug one or two feet deep, in others six or seven feet, and in some places not dug at all. Thus it remained for some years in pits, very irregular, and for the most part inundated with water, being contiguous to a river. In order to reclaim this unprofitable spot, the spirited proprietor first cut a large drain, in order to carry off the water, and then levelled the ground, laying it in straight, low ridges, about nine yards in breadth. Carriages were made on the tops of these ridges,

and from thence to the furrows or drains: between the ridges the ground was laid upon a descent, about one inch to a yard; drains were also made in the furrows parallel to the carriages. A cut was then made from the river to let the water into the carriages through a sluice made in the cut, and a small one in the side of it, to let the water out of the drains, when the meadow was to be laid dry.

In performing this work, the greatest attention and accuracy were necessary, and were given; because the *dip* of the river was low, and the water often did not rise sufficiently high to fill the carriages; and, therefore, he could not raise the ridges to such a height, and give them so great a descent as he could have wished. For, it should be observed, where it can be had, the descent should be greater than here, in order that the water may flow quickly over the sides of the ridges; and, as then more water is required to be thrown over them, a large portion of fertilizing sediment is deposited upon the meadow, and the water has not time to soak into it to such a depth as it otherwise would; and thus the land is prevented from becoming chilled, and the herbage from proving to be coarse and rank.

The proprietor of the meadow in question not having enough of the turfy staple to lay upon the ridges all over the meadow, he was reduced to the necessity of laying on it promiscuously such earth as came to hand; and, as much time would thus necessarily have elapsed before a good turf could be formed, and a good crop produced, he therefore sowed it with hay-seed. He then let the water on and off gradually, till the works were settled; the earth and mud scoured out was laid upon the low parts of the banks and the surface of the meadow.

As the supply of water was often inadequate, so that it could not be thrown over the whole meadow at once, he was under the necessity of watering it in divisions; having for this purpose made dams in the carriages, in proper places, so that he could turn the water on them at pleasure. This practice is worthy of notice, and deserves to be followed; for where it may not be convenient on farms to have three or four meadows to which the system of irrigation can be applied, yet it will be found very advantageous to divide one large meadow into three or more *panes*, or parts; for, as Mr. Boswell has justly remarked, while cattle are eating the first, the second will be growing, the third draining, and the fourth under water.

To return: notwithstanding all these inconveniences, the meadow in question produced, the third year after it was watered, one ton and a half of hay per acre at the first cutting, and was annually improving; whereas, before that time, it was scarcely worth 2*s*. 6*d*. per acre. The expense was about 5*l*. per acre, the soil being very easily dug, especially where it lay under water. The improvement thus effected was very great; and we trust the annexed plan will, together with its accompanying explanation, convey a more clear and intelligible idea of it than could be given by a mere verbal description.

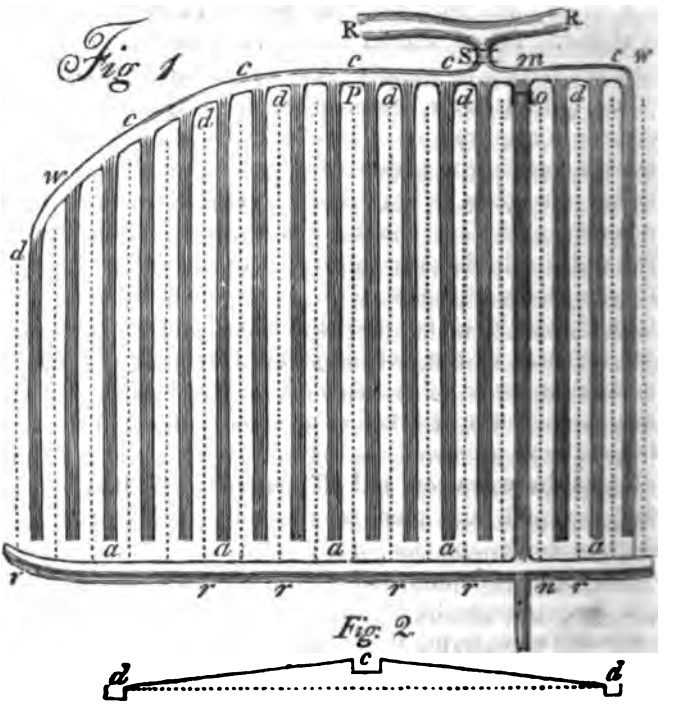


Fig. 1.—*w*, *c*, *c*, *w*, *a*, *a*, is the meadow, highest at *c*, *c*; whence it has a small gradual descent towards *a a*.

The whole meadow is divided into ridges, about nine yards broad each, which slope from the crown about thirteen inches towards the lower sides, or about one inch to every foot in breadth.

c c c is the main carriage, which (when the meadow is to be

flooded) is filled with water from the river R R, through a sluice at S.—*c a*, *c a*, are carriages which communicate with the main carriage at the upper side of the meadow, whence they are also filled with water; which, running over the sides throughout their whole length, flows over the grass, and then falling into the drains on each side, *d r*, *d r*, is conveyed into the drain *r r*, and from thence out of the meadow at *n*.

All the carriages of water-meadows should be broad enough to contain a sufficient quantity of water to flow over the whole surface of the land, and as quick as the supply from the river will permit. To make the carriages deep would be of no use, because it is only the water at the surface that flows over the sides of the carriages. A carriage kept full, that has only six inches of water, will throw as much over upon the meadow as if the water in it were six feet deep. But besides, there is a damage in deep carriages; a larger body of water does by its weight force deeper into the ridges, which chills the land, and makes it produce flags, and other aquatic weeds, to the great injury of the hay.

The drains *d r*, *d r*, are made between the ridges in the furrows, and parallel to the carriages: they are eighteen inches wide, and of a similar depth at the upper ends *d d*, and twenty-four inches wide, and the same depth at the lower ends *r r*.

The carriages, *c a*, *c a*, are widest (twenty-four inches) at their upper ends *c c*, to receive a sufficient quantity of water, and are gradually contracted from twenty-four to eighteen inches at their lower ends *a a*; by which contraction, the water being more and more confined, it rises a little, runs over the banks, and flows upon the grass on each side.

The drains, on the contrary, being made narrow at their upper ends, and widening, and also deeper towards the lower, are on that account capable of receiving the accumulating water from the carriages, which they discharge into the large drain *r r*, to be conveyed out of the meadow at *n*.

The main drain, *m n*, is four feet wide, and is made to receive the water out of the carriages, through a small sluice at O, which is to be opened for that purpose, when the meadow has been sufficiently watered.

If the bottoms of the carriages were level from one end to the other, the water could not be drawn out of them, but would stagnate there, and chill the ground, and make it produce sedge,

flags, and such coarse aquatic plants; for which reason the carriages are deeper towards their upper ends, next the river, by six inches, than at their further ends, *a a*. So that when the meadow has at any time been sufficiently watered, and is to be laid dry, by shutting the sluice at S, to prevent more water coming in from the river, and opening the sluice at O, the water begins immediately to run out of the carriages into the main drains, and are all emptied in a short time; and the water in the drains running off at the same time; the whole meadow is soon laid dry.

It is not necessary to continue the carriages so far as the drain *r r*, but they may be made shorter, by three or four yards: for the water that runs over at the ends of the carriages will spread, and flow over the intermediate spaces, from *a a* to the drain *r r*.

Where the water does not run over the sides of the carriages, or not equally, stops are, as before observed, to be put into the carriage a little below, which will make the water rise a little above the stops, and flow over the bank. These stops are made with pieces of turf laid across the carriage, by way of a dam. The turfs are to be laid higher than the surface of the water next the banks of the carriage, but a little lower in the middle for the water to pass there: in this form ⌣.

The sluice S, by which this meadow is watered, is two feet wide, and three feet nine inches deep. While the meadow is watering, the hatch or gate of the sluice is drawn up about two feet and a half, and then the water passes through an aperture of five square feet; which, supposing it runs at the rate of two feet in a second, the quantity of water thrown upon this meadow is ten cubic feet in a second, or above 560 tons an hour. A much larger quantity would be more beneficial; though a less supply would make a considerable improvement.

Fig. 2.—*d, c, d*, is a section of one of the ridges; *c* the carriage on the top of the ridge, and *d d* the drains into which the water falls, after it has flowed over the land on each side from *e* to *d*.

If there is not sufficient water to irrigate the whole meadow at once, it may be done in two or more divisions. As, suppose the part *w, c, m, p*, or about half of it, is to be watered first; make a dam across the main carriage at *c, p*, and then the part *w, o, p*, may be watered in the manner as already described: and the other part will remain dry. And, in order to water this

other part by itself, make a dam across the main carriage at *o m*, and at the upper ends of the other carriages from *o* to *p*; the water being then let in from the river, will fill the other carriages, and flow over this part of the meadow only.

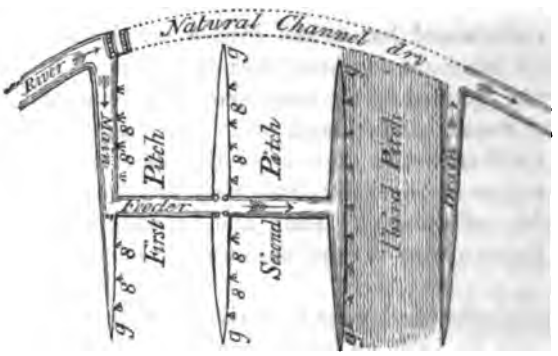
These dams across some of the carriages do very well occasionally; but where there is not a sufficiency of water—and a meadow must always be watered in divisions—it is the best way to put in small sluices in convenient places of the carriages, to turn the water on and off the several divisions of the meadow at pleasure.

When the water has flowed over a meadow, and is all discharged, if there are any other meadows situated below *n*, they may also be flooded in the same manner as the first, and with the same water: and though the improvement of the lower meadows will not be so great as of the uppermost or first meadow, it will be considerable, and very well answer the expense and trouble of watering them; and in some places the water is thus thrown over several meadows in succession, for some miles.

Any meadows contiguous to a river may be watered, though not laid out in such an accurate manner as in this example. For if the river be a little higher than any part of such meadows, main carriages may be made, and the water conducted to the highest parts, and other carriages made branching from them, and between the drains; which, though they cannot be cut quite parallel to the carriages, on account of the unevenness and irregularity of the ground, will, notwithstanding, very well answer the purpose, to a great improvement; care being taken not to place the carriages, or drains, too far asunder. The nearer they are together, so as there is room left to mow between them, the greater will be the improvement. Where there are any hollows, they should be filled, and the surface laid smooth with the earth dug out of the drains, that the grass may be mown very close.

There is another description of irrigation practised in the county of Gloucester, where it is termed *catch-work*. It is calculated for meadow and pasture lands, which lie on a steep declivity, or on the side of a hill. This method is denominated *catch*, because, when the whole is watered at once, the water, by the main cut or *feeder*, having attained the top of the piece of ground, floats over the uppermost pieces (in the language of

irrigators, *pitches* or *panes*,) and is caught in (i. e. falls into) the floating gutters which distribute the water from one *pitch* to another, till at length the water reaches the bottom of the field, where it is received into a drain for the purpose of carrying it off, or conveying it to other lands situated on lower levels. In this method of watering, fewer cuts are necessary than in the mode of floating above detailed; and these are made as nearly in parallel lines below each other as the bank will permit.



In this delineation of a catch meadow, selected from Mr. Wright's valuable "Art of Floating Land," the lateral, horizontal, feeding gutters, which distribute the water over the first and second *pitches*, are represented as shut by sods or stones (8), consequently they appear dry. The whole body of water is represented as passing down the main feeder into the lowest floating gutter, whence it floats the lowest or third pitch, and is received into the drain at the bottom of the meadow, to be returned by it into the natural channel.

When the whole is to be floated at once, the obstructions (8) are taken from the lateral floating gutters, other obstructions being in the mean time placed in the main feeder, immediately under the floating gutters, in order to force the water into such gutters. But, in obstructing the main cut, or feeder, care must be taken not to stop it *entirely*; but part of the water it contains should always be allowed to escape *in it* to the lowest panes, or pitches; for, supposing the main feeder to be entirely shut under the feeding gutter (g 1), so that the whole is made to run over the first pitch from such gutter and the horizontal

part of the main drain, the water, filtrated through the grass of the first pitch, would be so much divested of its fertilizing qualities, as to be almost incapable of communicating any perceptible benefit to the pitches lying beneath. Water thus filtrated is, in the language of Gloucestershire irrigators, termed *used water*, and is regarded as next to *useless*; and hence it is, that the grass growing nearest to the floating gutters is most abundant, and of the best quality, in all kinds of meadows.

The proper breadth of the panes or pitches of catch-meadow, from gutter to gutter, is by no means correctly determined; but it should seem, that they ought not to be much broader than the distance from the floating gutter to the receiving drain in *float-meadows*, that is, from four to six yards. *Catch-meadow* is not held in such estimation, or so profitable, as float-meadow.

As, however, the expense attendant on the system of irrigation is necessarily very considerable, the young farmer should, in the first instance, calculate the obstacles he is likely to meet with in the progress of his work, either from the stream of which he designs to avail himself, not being his property, or jointly his and another's; from his being prevented using it by the circumstance of intervening land belonging to others, of whom he must purchase a right to make a cut or feeder; or from water-mills, &c. Having obviated these inconveniences, his next step should be to take a level, by means of a spirit or water level, from the highest spot where the stream enters his property, following the dead level, and at every three or four hundred yards staking it out doubly, one stake on the dead level and another near it, descending so many inches as an allowance to give the water a current. Two inches in a mile will move it; though from twelve to twenty should be allowed, in order that the current may be sufficient. Should roads intervene, Mr. Young suggests, that they may be passed by the Italian method, which is to form a work of masonry to act as a syphon; the water is made to descend perpendicularly on one side of the road, in a brick or stone tunnel, to pass in an arch under the bed of the road, and rise on the other side in a similar tunnel, whence it passes on its course. But if the level be interrupted by farm-houses, gardens, cottages, &c. a much greater descent, per mile, must be allowed, in order that such

interruptions may be gradually provided for *. Having ascertained these points, he will commence in such place as his judgement leads him to think best calculated for that purpose.

All lands that lie low and are contiguous to the banks of rivulets, brooks, and springs, are capable of being watered, particularly where the water-course is higher than the lands, and kept within its bounds by the banks: and if the current have a very quick descent, the improvement by irrigation will be very great, attended with a comparatively small expense; because, in proportion to the greatness of the descent, the improvement is more speedy. But the lands more suitable for this purpose, are, in Mr. Boswell's opinion,

1. A *gravelly*, or sound, warm, firm, sandy soil; or, which is more frequently the case, a mixture of each, or almost any soil partaking of these qualities. Such soils, where there is a descent from the river, make an almost instantaneous improvement.

2. *Boggy*, miry, and rushy soils, which always occur near the banks of rivers, where the land lies pretty level, are capable of equal improvement with the other, when their respective values in an unreclaimed state are considered. In that state, indeed, swampy marsh-land is of little worth; but, by being judiciously watered and drained, it may be made to produce an ample crop of hay. More expense and jugdement, he observes, are necessary to bring this sort of land into cultivation; which also, when very boggy, requires more and longer watering than any sandy or gravelly soils. The larger, however, the body of water is that can be brought upon them, the more beneficial will be the consequences, as its weight and strength will greatly assist in compressing the soil and destroying the roots of the aquatic weeds growing upon it. An instance of the benefit resulting from this practice, in soils of the above-mentioned description, has been communicated to the public by Mr. Turner, of Bognor, in Sussex. Having about six acres of peat ground, through the middle of which there is a stream, especially in winter, he ordered it to be cleaned, and what came out to be cast on one side only, that he might turn and keep the water

* Farm. Cal. p. 301, where there are very many practical hints on this subject, which our limits will not permit us to notice.

over one half of the bog. He had then no other object in view but to keep the old ditch dry, for the more conveniently digging of the peat on the lower side of the bog; the water was thus continued for nearly two years, when part of the mound gave way, and, not having occasion to dig any more peat, the water resumed its natural course. The side where the water had run became a very tolerable meadow, the moss, rushes, and other aquatic vegetables being nearly gone; and it afforded such forward pasture, that he reckoned one year's grass to be worth more than it yielded for seven years before it was flooded.

3. *Strong, wet,* and *cold clay soils* are the most difficult to be improved by irrigation, not only from the dead level of their situation, but also from their tenacity, which will not admit of being drained without great expense and attention. But when this can be effected, and a strong body of water can be thrown over them from a fertilizing river, in the winter, and a warm spring succeeds, Mr. Boswell states, that the crops of grass upon such lands are immense*.

In addition to these remarks, it may be observed, that springy land is by no means fit to be watered, until it is rendered firm and compact by a thorough draining; because, if it be springy and wet, the water thrown upon it will soak into it, and cause it to produce at best only a coarse and rank herbage. There is no doubt, however, but that the system of irrigation may be applied, in many cases, with most promising prospects of advantage to mountainous moors; yet there are no tracts, perhaps, so much neglected as these. At this unaccountable neglect, Mr. Young has justly expressed his surprise, because there are scarcely any situations that do not contain such spontaneous proofs of the benefit, "as," to use his own expression, "might have been sufficient for a hint to the stupidest clown." The firm spots by the sides of the torrents acquire, from flooding, a beautiful verdure, that proves a perfect contrast to the weariness of the surrounding waste; and where there are small rills on the mountain sides, which have not sufficient strength to work out a regular bed for their waters, but which spread, they are universally attended with a verdure, (from the grasses subduing the heath, owing simply to the water,) which shows the advantage in the clearest manner.

* Boswell, on watering Meadows.

The principle recommended by Mr. Young, in order to effectuate this desirable improvement, is to throw over the sides of the mountainous tracts as much water, and with as much equality, as possible; carefully preventing that fluid from remaining in spots, and securing the works from being blown up by sudden floods, and heavy, impetuous rains.

The proper place for commencing this important work is, where there is a gentle declivity; then, ascending as high as the water may be conveniently commanded, a stone wear must be made across a torrent, just sufficiently high to form a little basin among the rocks, if none occur executed by the hand of nature. From the spot where such a basin is found or made, a trench is next to be opened, the course of which will be directed by the spirit level: care being taken to give it only the necessary degree of fall for bringing the water in a very gentle current. The stream is to be made to overflow out of this carrier trench all the way it runs; the trench must be made gradually smaller to the end, as the body of water it brings lessens in proportion as it advances. Here Mr. Young recommends the undertaker to pause for one or two years, to see the effect of his labour, without increasing the evidently trifling expense described; and, if he find that effect to be great, as he probably will, he then advises all the spaces over which the water is thrown to be levelled to that exactness which is necessary for mowing ground; the water is next to be let gently over, when the ground will soon be covered with grasses and other beneficial plants, to the gradual but certain destruction of heath, and similar pernicious vegetables.

There is great difference in the *quality of water*, arising from the various particles of matter that are mixed with it. In general, those waters which breed the best fish are best adapted to the watering of meadows. Those rivers, which have a long course through good land, are impregnated with fine particles that are highly fertilizing to the adjacent meadows, which are casually overflowed by them, especially during floods, when the water is full of a rich sediment; for, though river water, when clear, may, by constructing wears at a considerable expense, be raised sufficiently high to overflow the contiguous lands, and be of service to them; yet the improvement thus effected is by no means equal to that obtained from the same water when it is thick and muddy. Hence it has been suggested, that material advantage may be derived from raising

the mud in rivers at any time, and carrying it in the current of the water upon such contiguous lands as are sufficiently low to be overflowed. Where water runs slowly, it deposits a considerable quantity of fine sediment, which may be raised by harrowing the bottom with common harrows, or strong thick bushes, loaded, and drawn by horses along the banks of the river. Cases have occurred, where lands have been thus improved, which were situated far below the level of the mud, at a small expense; where there were carriages or carriers, made before, in order to distribute such thick water uniformly over the surface. The expedient above suggested has, indeed, long been practised in Lombardy, where a kind of heavy harrow is drawn along the bottom of the main carriers, for the purpose of disturbing the mud in autumnal, winter, and early spring irrigations; and the practice of throwing lime into the water has been successfully adopted in this country, the great divisibility of that fossil in water being well known.

The water running through poor soils is a very indifferent improver of land; and, if impregnated with mineral particles, (particularly of a ferruginous nature,) it is destructive to most kinds of plants. Hence it will in no case be adviseable to attempt a large improvement by irrigation, until the quality of the water be known; and this, in most instances, may be discovered by observing the effect it produces upon the herbage of the land which is sometimes inundated by it; and may be easily ascertained by watering a small piece of land with it, by way of experiment.

Rivulets and brooks, however, are (in Mr. Boswell's judgment) the streams that can be used to the greatest advantage; because the expense of erecting wears across them will not be great, neither do any of those objections exist to which large rivers are liable. Besides, if they flow through a cultivated country, the land floods, occasioned by violent rains, bring a very large quantity of manure, such as chalk-water, sheep's dung, and the draining of arable fields, as well as the scouring of roads and ditches, the runnings of farm-yards, the drains and sinks from towns and villages, all of which are carried by the rains into smaller currents, and thence into the larger streams, where (if there are no watered meadows) they are totally lost to the farmer *.

* Boswell, on watering Meadows, p. 8.

Springs may likewise be beneficially employed on the coarse lands contiguous to them, if a sufficient quantity of water can be procured to flood such lands. The springs in question are the heads of brooks and rivulets rising out of a chalky or gravelly, sound and firm soil, in a cultivated part of the country, and not those which rise out of poor, heathy, or boggy lands; for the water issuing from the latter is, in general, so small in quantity, always so very *lean* and hungry in quality, and often of an acid nature destructive of vegetation, that little if any advantage can be derived from them. But the former springs are invaluable; and every advantage possible ought to be taken to improve the lands lying near them. Of the beneficial effects produced by the springs first mentioned, Mr. Boswell gives a striking instance in a particular meadow that is watered by such springs, without any advantage from great towns, being situated only at a small distance below the head of the rivulet, which is supplied all the way by springs rising out of its bed as clear as crystal. The soil of the meadow in question is a good loam, several inches in depth, upon a fine springy gravel; and, whatever be the real cause, the fecundity of this water, he states, is beyond conception; for, when the meadow is properly watered and well drained, in a warm spring, the grass has frequently been cut for hay within *five weeks* from the time the stock was taken out of it, having eaten it bare to the earth. Almost every year it is cut in six weeks, and the produce varies from one to three waggon loads on an acre. In lands thus situated, in the mornings and evenings in the months of April, May, and June, the whole meadow will appear like a large furnace,—so considerable is the steam or vapour, which arises from the warmth of the springs acted upon by the sunbeams; and, notwithstanding the water is so uncommonly clear, yet, on being thrown over the land only for a few days during warm weather, by dribbling through the grass, so thick a scum will arise, and adhere to the blades of grass, as will be equal to a considerable quantity of manure spread over the soil, and (it may be fairly presumed from its effects) still more ameliorating. It should, however, be observed, that this scum must not be suffered to harden to a consistency like leather; which it will do, if the water be allowed to remain too long on the land, especially in warm weather *.

* Boswell, pp. 10, 11.

Further, *land floods* may be successfully applied to the important purpose of watering pasture lands; they will, indeed, be always found of great use where the sweepings of towns, farm-yards, &c. are carried down by them; and it rarely happens that any other erection is required, excepting a sluice, or small wear, to divert and convey them over the lands. Should the soil, however, be situated on the declivity of a hill, catch-drains often become necessary in order to water the lower part of the hill, after the water has been floated over the upper part. In many parts of this island, where there are large hills, or extensive rising lands, great quantities of water run from them into the valleys, after heavy or long continued rains; these might, with proper attention, be collected together before they reach the bottom or flat ground, and thence be diverted to the purpose of irrigating the subjacent lands with great advantage to the occupier, and at the same time at a trifling expense. Should the land thus situated be arable, it may be beneficially converted into pasture, especially if ground of this description be a desirable object to the land-owner. The following method of employing land floods, for this object, is recommended by Mr. Boswell, whose treatise on watering meadows we have already had occasion to notice.

First, observe the piece of land or field best adapted to this purpose, both in point of soil and of situation. In case it be arable, it should be previously laid very level, and with the crop of corn all sorts of hay-seeds should be sown; and, as soon as a green sward is formed, it may be laid out. Next, in the lowest part of the ground, is to be drawn a deep ditch, in which the current may run through it; which ditch should be continued into some other ditch, or low part, in the subjacent lands, in order that the water may be freely carried off after it has been employed, and also while it is in use. Then let ditches be drawn above the field intended to be watered, aslant the sides of the hill, in such a manner that they may all discharge themselves into the head of the ditch above mentioned, just where it enters the field to be watered. A wear being then erected across this ditch, the field may be watered, according to the situation of the ditch, either in the middle or on one side. It must then be conveyed by small *mains*, or trenches, and subdivided again by *branch-trenches*, according to the site of the field, and the quantity of water that can be collected. Of the

immense advantages arising from water thus collected and distributed over land, (which is mostly a firm, good soil,) those who are unacquainted with water meadows can form only an inadequate conception; for the water running down from rich cultivated hills, eminences, &c. carries along with it, during very heavy rains, immense quantities of dung dropped by sheep and other cattle, and the manure spread on arable lands; which, being thus conveyed over the intended meadow with an easy descent, allows time for the particles of manure to subside upon the ground at one season, or to be filtered through the young grass as it dribbles through it at another; and the subsequent warm weather greatly accelerates vegetation. Meadows thus situated, Mr. B. remarks, would be vastly superior to any others, if they had the advantage of a constant stream; though, even under the present existing circumstances, they will prove to be very valuable, if every opportunity be taken to water them with every heavy rain, or land flood, that occurs. And he strenuously advises the occupier of such lands, on no account to lose time in appropriating them to this use, because such lands are healthy for *all* kinds of cattle, at almost all seasons; while the expense of converting them into this kind of water-meadow is exceedingly small, the subsequent annual charges are very trifling, and the produce is very considerable *. In addition to the benefit resulting from this mode of employing land floods, it may be remarked, that farm-yard liquor (which at present is often totally lost by evaporation) is capable, on elevated situations, of being applied in a similar manner, if it can be procured in sufficient quantity, though, in other situations, there is no doubt but that it may be artificially raised and diverted over the fields contiguous to the farm with the greatest benefit †.

In regard to the proper time for flooding or irrigating lands, it may be observed, that this valuable improvement may be performed at any period of the year; though winter and spring, or from the latter end of October to the beginning of March,

* Boswell, p. 97.

† This method of employing farm-yard liquor has been successfully attempted by Mr. Fenna, whose interesting account, (which the protracted length of this chapter forbids us to state,) is accurately detailed in the Communications to the Board of Agriculture, Vol. II. p. 334—341, and illustrated with engraved plans.

are the two usual seasons for watering meadows; but experience and local circumstances are the best guides in this important operation. Supposing, therefore, that in October or November, which is the usual time in Gloucestershire, from heavy rains there is sufficient water for the whole number of meadows, (and, as already intimated, it is most advantageous to have three or four water-meadows if possible,) the mains, carriages, main-carriers, or feeders,—as the main-trenches are variously termed,—will be filled, and thence it will flow into the other trenches; when these are full, the edges of the mains, trenches, and drains are directed to be mown on both sides with a short scythe; when the water carries the dead grass, &c. as it is cut, down to the ends of the trenches, where it must be taken out with a fork, and thrown up into small cocks, to be carted off at the earliest opportunity. This necessary duty being performed, the operator, or *waterman*, goes up and down the main to see whether the water has risen to the requisite height; when any spots in the banks, that may be too low, should be raised to a proper level with small spits of green sward; and such as are too high must be pared down, so as to reduce the banks of the carriages or feeders to as accurate a level as possible, in order that the water may dribble properly over the meadow. The lateral and other trenches are to be frequently examined and levelled, or raised, and all obstructions removed, as circumstances may require, in a similar manner. The various drains must likewise be often inspected; if the water fill them, and rise over upon the edges, Mr. Boswell directs them to be widened, in case they cannot be made deeper; in this instance, however, very great floods are not to be regarded as the criterion, but a strong body of water.

Concerning the length of time during which the water is, at this period of the year, to continue on the land, there is a difference of opinion. Mr. Boswell thinks that the water may, with safety, be kept a month, or even six weeks, on corky, boggy soils, or strong clays; though a shorter period will be sufficient for a sandy or gravelly soil. But Mr. Wright* is of opinion, that three weeks are sufficient for this purpose; we conceive, however, with Mr. Boswell, that for the first-mentioned lands four or six weeks are not too much, because very boggy

* Art of Floating Land.

and swampy lands require more and longer watering than such as are of a drier nature. The larger the body of water that can be distributed over the former, the more beneficial will be the effects resulting from the practice of irrigation; for the weight and strength of the water will greatly assist, as already intimated, in compressing the soil, and also in destroying the roots of the aquatic weeds that vegetate on it. Neither can the water, in Mr. B.'s estimation, be well kept too long upon it, especially in winter, immediately after the after-math is eaten, for the closer it is fed the better; and this kind of soil, when well watered and drained, will equal the wishes of the most sanguine in its improvement. On warm sand, or gravelly soils, (which are most profitable where they can be flooded at pleasure,) a contrary practice must be adopted; the water ought on no account to be kept long at a time upon the land, but should be frequently shifted, the land well drained, and "thoroughly refreshed with it." *

In December and February, Mr. Wright advises the meadows to be laid dry, and to turn the water over it at night; otherwise, "if the water is suffered to remain for many days, a white scum arises, very destructive to the grass; which scum is raised chiefly when the sun is warm, and the water clear and thin." And if the land be now exposed, "without the covering of the water, to a severe frosty night, the greatest part of the grass will be killed;" whereas, by adopting the expedient above suggested, both these injuries, according to Mr. Wright, may be avoided. Or, the water may be taken off early in the morning; "and, if the day be very dry, the frost can do no injury, for it is only when the land and grass are wet, that the frost has this pernicious effect."

From this method of proceeding, Mr. Boswell, however, does not apprehend any dangerous consequences would arise. In regard to the supposed *fatal* effects of frost, the *contrary* appears to be the case; and the late Dr. Darwin † has suggested, that irrigation, in this island, may prove serviceable in protecting grass and other vegetables from the too severe effects of intense cold during winter, or in the vernal season. With this view, he remarks, that the water of strong springs, (whose tem-

* Boswell, p. 32.

† In his interesting work, intituled Phytologia; or the Philosophy of Husbandry and Gardening.

perature is in this climate constantly 48° of Fahrenheit's thermometer,) is preferable to river water, where a sufficient quantity of the former can be procured for the purposes of irrigation; the degree of cold in these two fluids being in a similar ratio with that of the atmosphere, till it declines to the freezing point, or 32°. Both river and spring waters, however, when distributed over the land, forming a thin sheet of ice on its surface, are beneficial; inasmuch as they defend the roots of grasses from the severe effects of too intense cold, and thus preserve them in a more healthy state. And thus the quantity of grass, in this cold climate, may be materially increased; so that, under judicious management, the annual proportion would be nearly double that produced under other treatment and other circumstances. In confirmation of Dr. Darwin's suggestion, we would remark the following *fact:* it often happens that the frosts of one night fix the *hatches*, or flood-gates, that admit water into the wears from rivers, so fast, that they cannot be removed until the frost breaks. Consequently, meadows are thus covered perhaps for several weeks with a sheet of ice, produced by a severe frost setting in while they are flooded; and after the frost is removed, those meadows always exhibit the *finest* verdure, and at the *earliest* period of the year.

With respect to the white scum above mentioned, it is clearly shown by Dr. Darwin, to be generated by stagnation of water, and consequently is the *effect*, rather than the *cause*, of injury to the growth of grass plants. It may always be obviated while the weather is open, by suffering the water to dribble or trickle gently over the meadow from the higher parts: though, as Mr. Boswell justly observes, the rays of the sun are rarely found to be sufficiently strong, to have any effect upon the water in the month of February. Nor is it an uncommon thing, he adds, in that month, to have the water kept upon the meadows for a fortnight or longer *. Accordingly, after the lands have been floated four or six weeks, in November, he directs the water to be turned out of one part of a field into another, and thence in the same into a third part, when it may be taken back again to the part first watered; a fortnight or three weeks will then be a sufficiently long time for the water to remain upon the ground. Thus, that fertilizing fluid may be

* Boswell, p. 117.

continued shifting from place to place; care being taken to examine attentively the various works, and to remove all obstructions. As the days increase in length, and the weather becomes gradually warmer, a proportionably less time (for instance, after Candlemas a fortnight, and the next turn a week) will be fully adequate for the purpose.

These various operations will bring the season to the commencement or middle of March, at which time there will be an abundant bite of sweet pasturage. As, however, the management, in this country, of meadows, after they are flooded, is already sufficiently known to the generality of farmers, we shall only, for the further information of our readers, subjoin a concise account of the American practice of watering land; and shall conclude the subject of irrigation with a brief statement of the numerous advantages that have already occurred, or which may be derived from a judicious and spirited adoption of this most important branch of rural economy.

According to the accurate inquiries of Mr. Strickland*, the practice of irrigation is known only in two parts of the United States, viz. Connecticut, and that tract in Pennsylvania in which the Germans have settled: but in neither of these places is it carried on to any considerable extent. The mode of applying the water is different in the two states:—In Connecticut, it is turned on the land as soon as the weather begins to become warm, in the spring; but it is not allowed to flow for more than twenty-four hours at a time. It is then taken off for a few days, then turned on again for twenty-four hours, and so on, till the meadow is nearly fit for cutting; immediately after which it is again applied in a similar manner for a second crop, and then again to force the after-grass in autumn; but it is always found to have the greatest effect upon the spring crop.

In this state, continues Mr. S., they also apply water to their lands in another very different and unusual manner; they flood great tracts of low meadows, situated on running water, just before the winter sets in, to the depth of two or three feet, by stopping the course of the stream, and thus let them remain covered till the spring, *in order to keep them warm, and defend them from the frosts.* In the following year, these lands pro-

* Communications to the Board of Agriculture, Vol. II. p. 165.

duce a considerable quantity of coarse hay, which, in consequence of the fine climate in summer, being very well got in, is eagerly consumed by the cattle in winter. After the hay is cut, these fields are pastured for the remainder of the year.

In Pennsylvania, the water is usually turned on the meadows about the middle of April, and is allowed to flow about two months; a few days after which, the ground having become dry, the crop is cut. As soon as the crop is off, the water is again turned on for three or four weeks, or till the land get a sufficient covering to defend itself from the sun, which, at that season, is very powerful. A second crop is then soon ready for the scythe; after which the water is allowed again to flow over it, till within a short time before it is wanted for pasturage, when it is turned off, that the ground may become sufficiently hard to bear the treading of the cattle without injury. Mr. Strickland has not been able to ascertain which of those two modes of applying the water may be most productive, as he has not seen the meadows of the Connecticut during the summer season; but those of Pennsylvania, he adds, bear abundant crops. But, since the introduction of clover, these meadows are falling fast into disuse, many of them having been ploughed up and converted into tillage, so that no further improvements can hereafter be expected in this branch of American rural economy.

The system of irrigation is carried on to the greatest extent in the counties of Wilts, Dorset, Hants, &c., and particularly in Gloucestershire, the farmers of which last-mentioned county are thus enabled to commence the making of *cheese* at least one month sooner than those of other districts, who have not the same opportunity. So highly, indeed, is water prized for this purpose in Gloucestershire, that the privilege of keeping up the water for turning corn mills, is regarded as a grievance; and those who have this privilege, obtain high rents for the temporary use of the water. In illustration of this circumstance, it may be added, that on the river Churn, which is a branch of the Thames, there were ten corn-mills erected on a stretch of five miles of the water's course, which yielded annually *four hundred pounds*. Upon the same stretch there are one thousand acres of meadow, supposed to be improved by irrigation to *two pounds* per acre of yearly rent above their former value, although they are of necessity but imperfectly watered.

from the obstruction of the mills; thus producing a difference of *one thousand six hundred pounds* annual rent, in the different mode of using the water.

Further, not only are common meadows greatly enriched, and boggy lands reclaimed by the proper application of water, as already hinted, but also its utility is yet more clearly evinced from this circumstance, that, from the uncommon forwardness of the grass, the feeding between the months of March and May is worth one guinea an acre; in June, one acre of water-meadow will yield two tons of hay, which sells, at different times, from *fifty shillings* to *five pounds* per ton, according to the quality and quantity of the herbage, and the extent of the demand; and the eddish, or after-grass, may be valued at *fifteen* if not *twenty* shillings an acre, whether the season be wet or dry.

Upon the whole it is evident, that *irrigation* is not only a great improver of land, but is likewise capable of being carried on to the greatest extent by seizing and making use of the various convenient situations afforded by nature, and by calling in the aid of machinery for conducting water into those situations where it would otherwise be impracticable to flood land. It ought not, however, to be concealed, that an apparently formidable objection has been started against this system of improvement, which may possibly produce unfavourable impressions in the minds of persons otherwise disposed to favour it, viz. that the great body of water thus constantly spread on the surface of the earth must necessarily render the surrounding atmosphere humid, and consequently prove injurious to the health of the inhabitants. But no such apprehensions need be entertained, provided the irrigation be properly conducted; as in this case the water is always in motion, and of course cannot possibly stagnate, or exhale any noxious vapours.

CHAPTER XII.

ON WARPING.

THE improvement of land by *warping* is one of the most singular that has ever been brought before the agricultural world;

and its effects greatly exceed those produced by any other mode. It consists in admitting the tides of large rivers to deposit their sediment, or warp, and letting it run off again as the tide ebbs. Such is the aim and effect of this remarkable process; but, in order to render it more efficacious, the water must be perfectly at command, so as to be excluded or admitted at pleasure. Hence it is necessary not only to cut a canal communicating with the river, but also to have a sluice at the mouth, which may be opened or shut as circumstances may require; while, in order that the water may be of a proper depth on the surface of the ground to be warped, and also for preventing adjacent lands from being overflowed, banks are raised around the fields to be warped, from three or four, to six or seven feet in height, according to circumstances. Thus, says Mr. Young, if the tract be large, the canal which takes the water may be made several miles in length: it has been tried as far as *four*, so as to warp the lands on both sides the whole way, and lateral cuts may be made in any direction for the same purpose; allowing the water longer time to deposit its sediment, because the effects decrease in proportion as it recedes from the river *.

The following practical hints for conducting the important process of warping, we give in the words of the Right Hon. Lord Hawke, selected from the "Survey of the Agriculture of the West Riding of Yorkshire."

"The land", observes his lordship, "to be warped, must be banked round against the river. The banks are made of the earth taken on the spot from the land; they must slope six feet; that is, three feet on each side of their top, or crown of the bank, for every foot of perpendicular rise: their top or crown is broader or narrower, according to the impetuosity of the tide, and the weight and quantity of water, and it extends from two feet to twelve; their height is regulated by the height to which the spring tides flow, so as to exclude or let them in at pleasure. In these banks there are more or fewer openings, according to the size of the ground to be warped, and to the inclination of the occupier; but, in general, they have only two sluices, one called the *flood-gate*, to admit; the other called the *clough*, to

* Farmer's Calendar, p. 390.

let off the water gently; these are enough for ten or fifteen acres. When the spring tide begins to ebb, the flood-gate is opened to admit the tide, the clough being previously shut by the weight of water brought up the river by the flow of the tide. As the tide ebbs, the weight or pressure of the water being taken from the outside of the clough next the river, the tide-water that has been previously admitted by the flood-gate opens the clough, and discharges itself slowly, but completely through it. The cloughs are walled on each side, and so constructed, as to let the water run off, between the ebb of the tide admitted, and the flow of the next; and to this point particular attention is paid. The flood-gates are placed so high as only to let in the spring tides when opened. They are placed above the level of the common tide.

"Willows are also occasionally planted on the front of the banks, to break the force of the tides, and defend the banks by raising their front with warp thus collected and accumulated; but these willows," Lord H. remarks, "must never be planted on the banks, as they would destroy the banks by giving the winds power to shake them."

The effect derived from warping differs greatly from that produced by irrigation; for it is the *mud*, and by no means the *water*, which produces the effect; so that in floods, and also during winter, this business entirely ceases. In fact its tendency is not to *manure* but *create* soil; hence the nature of the land is a point of little moment, almost every soil, whether peat, sand, bog, or clay, but especially light land, being equally benefited, as the warp raises it in one summer from six to sixteen inches in thickness; and, in low places, or hollows, two, three, or four feet, so as to leave the surface level. "Thus," Mr. Young observes, "a soil of any depth you please is formed, which consists of mud of a vast fertility, though containing not *much* besides sand; but a sand unique." From a careful analysis by an eminent chemist, warp consists of a large quantity of mucilage, a very little saline matter, and much calcareous earth; the residue is *mica* and *sand*, the latter in much the largest proportion, but both being in extremely attenuated particles; and Mr. Y. conjectures (though no notice is taken of any argillaceous ingredient) that some warp must contain clay, from the circumstance of its forming small clods and cleansing

cloth from grease, not unlike fullers' earth. He adds, that in the opinion of a considerable *warp-farmer*, the stiffer sorts of warp are the best*.

A remarkable instance of the beneficial effects resulting from the practice of warping, occurs in the farm of Mr. Webster, of Bankside, which contains 212 acres, and is entirely warped. To evince the immense importance of this improvement, it may not be useless to state, that he gave 11*l.* per acre for the land, for which he would not at present take *seventy pounds* per acre: he thinks it worth 80*l.* and some parts even worth *one hundred pounds;* not that it would now fetch so high a sum. His whole expences for sluices, banks, cloughs, &c. did not exceed 2,500*l.* or 12*l.* per acre; which may, indeed, be reduced to 1,000*l.* or 5*l.* an acre, as a neighbour below him has offered 5*l.* an acre for the use of his sluice and main cut, to water 300 acres. Estimating, however, at the highest sum, 12*l.*—11*l.*, the purchase money, must be added, making the whole 23*l.* per acre; which, if he can sell at 70*l.* leaves a clear profit of *forty-seven pounds* per acre: a prodigious sum, which, Mr. Young remarks, is sufficient to prove that warping exceeds all other improvements.

Mr. Webster has warped to various depths, from eighteen inches to two feet, two feet and a half, &c.; and he has some moor land, which, previously to being warped, was worth only *one shilling and sixpence* per acre, that is now as good as the best land; and some of which would let at 5*l.* for flax or potatoes, and the whole for 50*s.* an acre. Our limits forbid us to enter into further particulars respecting the efforts of this enterprising agriculturist; hence we shall only mention a few circumstances relative to the crops which his warped land has produced.

Of *potatoes* he has had from *eighty* to *one hundred and thirty* tubs, of thirty-six gallons per tub; selling the round sorts from *three shillings* to *three shillings and sixpence* the tub, and kidney potatoes from *five* to *eight shillings*. Six acres of *beans* yielded *thirty* loads, or *ninety* bushels per acre; and one acre (which was measured, in order to decide a wager) is stated to have yielded *ninety-nine* bushels: one bean, on four stalks, has produced 144 pods; and Tartarian oats have been seven feet

* Agricultural Survey of Lincolnshire, p. 277. Farm Cal. p. 392.

in height. Mr. Webster warped one piece in 1793, which, in the following year, produced six quarters of oats per acre; white clover and hay-seeds were sown with the grain, and mown twice in the first year: the first cutting afforded *three tons* weight per acre, the second one ton, and after that appeared an immense eddish or after-grass. It ought, however, to be observed, that warp brings weeds, especially mustard cresses, and wild celery, with abundance of docks, and thistles; but it destroys rushes and similar aquatic weeds.

The cost of a sluice for warping, that is five feet in height, and seven feet in width, is estimated by Mr. Young to be from four to five hundred pounds. Such a sluice will be adequate to the warping of fifty acres annually *; and, if the soil be contiguous to the river, it will be sufficient for seventy.

The practice of warping commences in the month of June, and is carried on throughout the summer; in fact, that is the only season in which this admirable improvement can go on, and therefore the agriculturist ought carefully to avail himself of every tide, and to keep his works in constant repair, that he may not (if possible) lose the benefit of a single tide through neglect, or any other untoward circumstance. This method of ameliorating land is at present chiefly confined to the farmers residing on the banks of the Don, Ouse, and Trent, to whom it proves a source of immense profit; hence it is highly probable, that the practice of warping may be successfully adopted on low lands adjoining to rivers, the tides of which are often impregnated with mud.

* Farm. Cal. p. 394.

BOOK THE NINTH.

ON THE CULTIVATION AND APPLICATION OF GRASSES, PULSE, AND ROOTS.

CHAPTER I.

ON THE NATURAL GRASSES USUALLY CULTIVATED.

BEFORE we proceed to discuss the various particulars connected with this department of our labours, it may not be useless to observe, that as the present work is chiefly calculated to assist those who are exclusively occupied in the *grazing and feeding of cattle*, the subject of tillage-lands will be introduced so far only as these are auxiliary to the farmer in affording a variety of vegetable crops, which are adapted for supplying him with succulent food for his stock. Our more immediate attention being called to the plants best adapted for pasture land.

Nature has provided in all permanent pastures a mixture of various grasses, the produce of which differs at different seasons. When pastures are to be made artificially, such a mixture ought to be imitated; and, perhaps, pastures superior to natural ones may be made, by selecting due proportions of those species of grasses fitted for the soil, which respectively afford the greatest quantities of spring, summer, latter-math, and winter produce. As some observations on the same topic have already been made in our notice of the culture of grass-lands *, we shall

* Book VIII. Chap. V.

in the present Chapter invite the reader's attention, first, to the natural grasses annually cultivated: we shall then treat of those wild or uncultivated grasses which are worthy of being cultivated; of the artificial grasses or green crops which particularly deserve attention, and lastly of the vegetables best calculated for fodder, together with the best modes of storing and preserving them.

There are upwards of two hundred distinct kinds of grasses, capable of cultivation in this country, differing from each other in their qualities and value, and, separately, very generally of but little worth: yet, when collectively combined, in certain members and species appropriate to the soil, they form our richest pastures, and thus compose that sward which is in the aggregate termed grass, on the component parts of which depend its value, either as a close pasture for sheep, as deeper grazing for heavy stock, or as meadow: of these it must be obvious that, in this limited treatise, we can only notice a few of the most prominent.

1. Crested Dog's-tail (*Cynosurus cristatus.*) This grass will be found useful in the formation of upland pastures, as it affords a wholesome food for sheep: it produces a thick, short turf, and flowers about the middle of June. It abounds with seed, which may be easily procured; but attention should be paid that the seed is *ripe*, otherwise it will fail. It grows naturally in dry situations, but will not thrive in very wet meadows; and, according to Mr. Stillingfleet*, it makes a very fine turf upon dry, sandy, or chalky soils. Sheep and deer are remarkably fond of this grass.

2. Darnel, or Ray-grass (*Lolium perenne*).—This valuable grass is now well known and cultivated throughout England; though, from its having been cultivated in improper situations, and from improper seed, a considerable prejudice has been raised against ray-grass. Sheep prefer it to any other grass, in the early stage of its growth; but leave it for almost any other kind, after the seed approaches to perfection†. It is accused of running so much to seed-stalks, that, after a short time in the spring, it is refused by cattle. In a proper soil, however, this is not the case. Darnel abounds with succulent leaves, that

* Stillingfleet's Tracts, p. 390.

† Sir H. Davy's Agricultural Chemistry, p. 365.

are extremely grateful to cattle: it attains the height of two feet, and flowers towards the end of May or early in June; and, by its early springing up, it supplies cattle with wholesome food at a time when it is very difficult to be procured. "Clean hay, made of this grass," says Mr. Sole *, "is particularly preferable for race-horses or hunters, as it does not affect their wind, nor blow them as other hay does; and notwithstanding it runs all to bents, yet the juice is so concentrated in them as to afford greater nourishment." He mentions an instance of a fine crop belonging to a Mr. Croom, well got in, of which his horses were so fond as to reject clean corn for it.

3. Meadow-fescue (*Festuca pratensis*).—The meadow-fescue is an early perennial, and very hardy grass; thriving with uncommon luxuriance in almost every soil, producing very sweet herbage, which is eaten with avidity by every sort of cattle, making excellent hay, and producing abundance of seed which may be easily gathered. It bears a very great resemblance to the ray-grass, to which it is in many respects greatly superior, at least for forming or improving meadows; as it is much longer, and more productive of foliage. It flowers about the middle of June.

4. Meadow fox-tail (*Alopecurus pratensis*).—This is one of the earliest grasses produced in our climate: it vegetates quickly, and with such uncommon luxuriancy, that according to Mr. Curtis, it may be well cut thrice in the year. Its stalks are strong, and provided with soft, juicy leaves, of a sweetish, agreeable taste; and, when made into hay, it possesses neither the hardness of straw, nor the roughness and unpleasant taste attendant on some of the grasses. It is, therefore, justly considered as holding the first place among the good grasses, whether used in a fresh state as fodder, or made into hay. Oxen, however, relish it less than sheep and horses. The soil best suited to it is sound meadow-land, occasionally overflowed; though it will succeed on almost any soil, except the extremes of wet and dry. It is also found to grow with great luxuriance on stiff clays. It produces abundance of seed, which may be easily gathered while the grass is growing, as this plant out-tops most others;

* Letters and Papers of the Bath and West of England Society, Vol. IX. p. 149.

but the seeds are not found in hay, for they ripen and fall out, before the other grasses are fit to be cut.

5. Smooth-stalked Poa, or Meadow-grass (*Poa pratensis*).—This grass is one of the finest and most useful of any we have; it vegetates on the driest soils, and may be seen flourishing on the tops of walls. It flowers in May, and possesses the very valuable property of resisting excessive drought, having been remarked to be green in the gravelly pastures near London, when every other grass has been parched by drought. The smooth-stalked poa yields abundance of seed, which, in a separate state, are difficult to sow, on account of their filaments causing them to adhere together. To counteract this inconvenience they may be put into newly-slaked lime, in order to separate them; and if afterwards well rubbed in a sufficient quantity of dry sand, they may then be sown with proper regularity.

The smooth-stalked poa is a sweet grass, and readily eaten by cattle in general. It carries its verdure in the winter better than most others, and in the following spring throws out numerous young shoots, so as to make excellent spring food. It produces a good crop of leaves at the bottom, which make exceedingly fine hay, and is fit for cutting early in the spring.

6. Sweet-scented Vernal, or Spring-grass, (*Anthoxanthum odoratum,*) is one of the earliest British pasture grasses, and grows in almost every situation, though it is not equally productive: it flowers in May and June. Mr. Swayne thinks it of little consequence, as it is neither very productive to the farmer, nor relished by cattle: it is certain that cattle will not eat it while they can get at other grasses. Other agriculturists, however, are of a different opinion; and Mr. Sole conceives, that the spring-grass would be a useful addition to meadows, if sown in the proportion of one-eighth *. This is the only odoriferous grass produced in our climate, and imparts the delicate flavour perceptible in new hay. It is less productive of seed than many of the other grasses; and Mr. Curtis states, that, in certain situations, particularly in dry seasons, its leaves are liable to become blighted, from a disease which changes their colour to an orange tinge, and which is very hurtful to this vegetable when in a state of cultivation †.

* Sole, in Bath Papers, Vol. IX.

† Curtis's Practical Observations on British Grasses, p. 7.

7. Yorkshire White, or Meadow Soft-grass, (*Holcus lanatus*,) is a perennial, flourishing well in any moist situation: it flowers in June and July, and grows in large tufts, or branches, producing ears nearly resembling the common white soft-grass; (*Holcus mollis*,) but exceeding it in size: it is partly a creeper, for the lower joints often throw out both roots and buds *. It is chiefly calculated for sheep, and has answered uncommonly well, when closely fed. This grass is not much relished by other cattle, and is said to be very injurious to horses, which become affected with a profuse discharge of urine and general weakness; but should any hay made from this grass be accidentally given to these animals, an immediate change of food will prevent any further ill effects. Its foliage is soft and woolly: if not disliked by cattle on that account, Mr. Curtis says, it may rank with some of the best grasses. If it were more early, it would be more valuable.

CHAPTER II.

ON THE WILD, OR UNCULTIVATED GRASSES, WORTHY OF CULTIVATION.

Besides the grasses already enumerated, and distinctively termed *natural*, because they are most commonly found in pastures, and have, therefore, been generally cultivated, there are many others still in a wild state, or only lately introduced to the notice of the agriculturist, which merit attention.

1. Sheep's Fescue, (*Festuca ovina*,) is a perennial grass, growing in dry, sandy soils, and flowering in the month of June: if sown on clayey soils, it is soon overpowered by other grasses. Cattle in general will eat this sort of grass, to which sheep are extremely partial, and soon become fat from its use.

2. Hard Fescue, (*Festuca duricuscula*,) flourishes in almost every situation, wet or dry, and is in blossom in June. This grass has a peculiar claim to the attention of practical agricul-

* Statistical Survey of the County of Antrim, Part I. p. 257.

turists, as it is very luxuriant, often attaining the height of three or four feet, and shoots forth very early in the spring. It affords a wholesome food, which is much relished by cattle of every sort: but Mr. Curtis has found, that, "though it thrives very much when first sown, or planted, it is apt to become thin, and almost disappears after a while." From its natural place of growth, however, he thinks it appears to be a proper grass to be mixed with those intended for sheep-pastures.

3. Annual Poa, or Meadow-grass, (*Poa annua*,) sometimes called Suffolk-grass, grows in pastures, gravel-walks, and the borders of fields, and is in flower throughout the summer. Cattle of every description are very partial to this species of poa; and as it is found in the greatest abundance in the county of Suffolk, where some of the best butter is made, it has been strongly recommended to notice by the late Mr. Stillingfleet, who conceives it to be the best for milch cows.

4. Rough-stalked Poa, or Meadow-grass (*Poa trivialis*).—This grass bears a great resemblance to the preceding, both in its general appearance, and especially in its time of flowering; but its qualities are widely different. While the smooth-stalked meadow-grass, Mr. Curtis remarks, is found chiefly in dry pastures, the rough-stalked poa principally occurs in moist meadows, or on the edges of wet ditches. It is eagerly eaten by sheep, oxen, and horses, and delights in moist and sheltered spots; but, though it possesses the advantageous property of being very productive, and consequently is excellently calculated either for pasturage or for hay, it is a tender grass, and liable to be injured by severe cold, or excessive drought *.

5. Silver Hair-grass, (*Aira caryophyllea*,) is common on sandy pastures, and flowers in July. Its culture is strenuously recommended by Mr. Stillingfleet, as being peculiarly well adapted for sheep-walks; as he has always observed this species to abound in those counties which are celebrated for delicious mutton.—Mr. S. applies the same remark to the heath or waved mountain Hair-grass, (*Aira flexuosa*,) which grows chiefly on heaths, in woods, and barren pastures. It is in flower from June to August.

6. Creeping Bent-grass, (*Agrostis stolonifera*,) affords a wholesome food to cattle vegetating with such luxuriance as to

* Curtis on Grasses, p. 11.

suppress the growth of moss and other weeds. The value of this grass has been ascertained only of late years: in Ireland it is known by the name of *Fiorin Grass*, under which appellation it was introduced to public notice in the year 1810, by the Rev. Dr. Richardson of Clonfecle, in the county of Antrim. Much difference of opinion, indeed, has prevailed with respect to its real utility; but, as the design of this treatise is to diffuse practical knowledge, we shall wave all controversy, and endeavour, with the utmost brevity, to state the qualities and culture of this species of grass.

The Creeping Bent-grass, or Fiorin, (as it is now generally termed,) abounds in moist fields and meadows, where it puts forth a great profusion of lateral strings, (*stolones*,) like the strawberry, which nature designs for propagation. The root consists of numerous small fibres, not thicker than silk threads, nor more than an inch and a half in length; which do not penetrate deeply into the earth, and take only a slight hold of the soil. It has sometimes been confounded with the *quicken* or knot-grass, a noxious and exhausting grass of the worst quality, from the resemblance of their roots; but the difference may easily be ascertained by comparison, as the root of the fiorin is very slender and simple, while that of the quicken is long and tangled.

The qualities which this grass is stated to possess, are as follow:—

1. It grows luxuriantly in low and swampy grounds and mosses, which, but for its cultivation, would be of very little or no value.

2. It grows in very great quantities; the most favourable situations, which are irrigated meadows, having been known to produce above four times the weight of any single crop which is generally raised of any other grass.

3. All horses, sheep, and cattle, are extremely fond of it, and actually prefer fiorin hay to any other hay whatever.

4. From the nature of this grass, and from the length of time which it annually vegetates, it may be used with much advantage as green food, during the greatest part of the winter. And

5. *It may be made into hay during the winter, whether the season is wet or dry.* The strings of the fiorin are said to preserve their vegetable life for a long time after they

are separated from the ground, and consequently retain their saccharine juice, thus imparting a most agreeable flavour to the hay. On this account also the hay will not rot, like common hay, when exposed to wet weather; and therefore may be cut at any period of the year, even in the midst of winter. This quality, however, has been found, in one respect, very inconvenient, when fiorin has been used for soiling: for, as many of the strings are unavoidably carried to the dung-heap, they have taken root when this manure has been laid on the land; and it is extremely difficult to eradicate the grass when it has once got possession of the ground.

With respect to the mode of planting,—fiorin may be laid down in the months of September, October, and November. If the land require draining, that operation must be previously performed, as the ground should be laid completely dry; and if the soil to be laid down be a lay, it should be summer-followed, and all stones, roots of weeds, and other rubbish, carefully gathered and removed. When the surface of the ground is well pulverised, the grass may be scattered upon it. This may be done in two ways, either by sprinkling the strings uncut, or by scattering cuttings of them upon the surface, over which cuttings whole strings are sometimes strewed. The cuttings are prepared by women, who first twist the strings into loose ropes about the thickness of the arm, which are cut by other women with a hedge-bill, upon a plank, into lengths of about three inches and a half: it is these cuttings which are sprinkled upon the surface; but whether they, or entire strings be thus strewed, it will be necessary to lay them on the ground very thick, as otherwise there will be little or no crop obtained the first season. When this work is done, the grass should be covered with a slight top-dressing of lime and *free* or loose earth well mixed and pulverised, or with peat ashes and earth well mixed: then, if the ground be dry, it should be rolled with a wooden roller, and ought to be carefully inclosed, so as to keep out cattle and sheep. The land, laid down with fiorin the preceding year, should be weeded by hand two or three times in the following months; and if this be carefully done, there will be no occasion to weed again *.

* Tracts on Fiorin-grass by the Rev. Dr. Richardson, 8vo. 1810. Farmer's Magazine, Nos. XLIX. and L.

Fiorin grass, to be in perfection, requires a moist climate or a wet soil; and possesses this very peculiar advantage, that it will grow on cold clays unfitted for other grasses; but its most valuable property is, that it flourishes in the very depth of winter, at which season it affords a succulent, though not very nutritive, green food for young stock and cows, without imparting any unpleasant flavour to the milk. In light sands and dry situations, its produce is much inferior both in point of quality and of quantity*.

7. Tall Oat-grass, (*Avena elatior*,) flowers in June and July: it vegetates with uncommon luxuriance, and, though coarse, is very profitable when closely fed down; it makes tolerable hay, and produces a very plentiful after-math. In point of excellence, Mr. Curtis ranks it next to the meadow fox-tail grass for which he thinks it may prove no bad substitute. Its seed may be easily procured; and, from an experiment of Mr. Swayne, it appears to have yielded a greater weight than any sort of grass †; but according to Sir H. Davy‡, though very productive, it is disliked by cattle, especially by horses; which, he says, perfectly agrees with the small portion of nutritive matter it affords. He adds, that it seems to thrive best on a strong tenacious clay.

8. Yellow Oat-grass, (*Avena flavescens*,) thrives in meadows and pastures, and on hills, in calcareous soils, where it flowers in June and July: it is a coarse grass, and though tolerably sweet, is much inferior to the meadow (*poas*) and fescue grasses: the late Dr. Withering has asserted, that it is not relished by cattle, though Mr. Swayne thinks it one of the best grasses of this genus for the use of the farmer §; and Mr. Curtis says, it promises to make good sheep-pastures ‖. Sir H. Davy confirms this opinion, and says, that it nearly doubles the quantity of its produce by the application of a calcareous manure ¶.

9. Flat-stalked or creeping Poa, or Meadow-grass, (*Poa com-*

* Sir H. Davy's Agricultural Chemistry, p. 366. See also the Agricultural Survey of the County of Antrim, Part I. p. 250.

† Young, in Communications to the Board of Agriculture, Vol. III. p. 146.

‡ Lectures, p. 368.

§ Gramina pascua.

‖ Curtis on Grasses, p. 18.

¶ Lectures, p. 369.

pressa,) flourishes in very dry situations, and flowers from June to August. This grass is, in Dr. Anderson's estimation, the best and most valuable of all the poas; its dark saxon-green leaves are compact and succulent, and grow so firmly together as to form a pile of the richest pasture-grass. Its flower stalks vegetate throughout the summer; and, even when decaying, the leaves retain their beautiful green colour. It produces a fine turf in parks and lawns; and imparts a delicate flavour to the flesh of sheep and deer, to which animals it is peculiarly grateful.

10. The Meadow Cat's tail, or Timothy-grass, (*Phleum pratense*,) though it delights in wet situations, seems to attain its greatest perfection in a rich deep loam: it is very productive, but coarse, and flowers late. All the agriculturists and travellers of America concur in giving this grass the highest commendations, as being the chief support of cattle wherever meadows are found. From the inquiries made by William Strickland, Esq. at the request of the Board of Agriculture, concerning this far-famed grass, it appears to be extensively cultivated on the middle and northern states of the American Union: he has frequently seen extraordinary crops of it growing as thickly as it could stand on the ground, three or four feet high, and in some instances as coarse as wheat straw. In this state it is cut before maturity; and as the hay in America is always well cured, however succulent it may be at the time of cutting, horses prefer it to every other kind of hay, and thrive better upon it. No other grasses approach it in produce; and it is stated to be particularly useful when mixed with red clover, in preventing it from falling too close to the ground.

Since his return to England, Mr. S., by cultivating it in his garden, ascertained it to be the same as the cat's-tail grass; but was doubtful whether, if it were cultivated in the field, and should grow with American luxuriance, an English sun would be able to cure it with American perfection *. The success, however, with which it has been cultivated, prove it to be every way adapted to an English climate and soil. When used for green food, for which purpose it is particularly well calculated, it may be cut twice or three times in one season; but, when intended for hay, it ought to be cut fully a week before it flowers †.

* Communications to the Board of Agriculture, Vol. II. p. 162.

† Sinclair on Scottish Husbandry, Vol. II. (Appendix) 106.

Mr. Curtis asserts it to have no excellence that we are acquainted with, which the meadow fox-tail does not possess in an equal degree *. The Rev. Mr. Young, however, has made several trials of keeping it closely fed by sheep, upon a moist loam, and a clay marl bottom. The success was sufficiently encouraging to evince that this plant is deserving of attention; especially as its seeds may be easily procured in any quantity from America, at the price of about one guinea per bushel; which, he observes, is enough, in conjunction with other grasses, for four or five acres of land. He observes, that four pounds, (the proportion per acre fixed by Bartholomew Rocque, by whom this grass was first introduced into England,) are much too little; and is of opinion, that timothy is best adapted to moist loams, especially peat †. Whoever gives it a fair trial, will find it a most valuable acquisition.

11. Yarrow, (*Achillea millefolium*,) is one of the most common and valuable plants growing in this island. It is found on moist loams, almost equally with dry, burning gravels, sands, and chalks. It possesses the singular quality of resisting drought on the most arid soils; so that if a green spot appear in a burnt-up, close-fed pasture, it may be almost certainly concluded to be covered with this plant. Yarrow is found in the best bullock pastures, where it is highly grateful to every description of cattle, particularly to sheep, which bite it as fast as it grows; so that, on tolerably well-stocked pastures, it is rarely suffered to come into flower. It is suited to almost every soil, flowers in June and July, and is a plant every way deserving of attention ‡.

12. Rib-grass (*Plantago lanceolata*).—On rich sands and loams, this plant produces a considerable herbage; and, on poorer and drier soils, it is asserted to answer well for sheep, though it is inferior to some others. Mr. Marshall states, that it has stood the test for twenty years' established practice in Yorkshire, and is in good estimation; though it is not well affected by horses, and is bad for hay, on account of its retaining its sap. Linnæus remarks, that it is eaten by sheep, horses,

* On Grasses, p. 30.

† Young, in Communications to the Board of Agriculture, Vol. III. p. 146.

‡ Young in Communications, &c.; and Anderson's Essays on Agriculture, Vol. II. p. 253.

and goats, and wholly refused by cows; though the astonishing richness of the milk in the celebrated dairies of the Alps is, by the late eminent Baron Haller, attributed to the food obtained from this plant and the common lady's mantle (*Alchemilla vulgaris*, L.). Its seed is plentiful. When it grows detached from other plants, the late Dr. Withering has observed that he has never seen cattle touch it. Notwithstanding the very high recommendations which have been given to this grass, it has of late years fallen into a degree of disrepute.

13. Cock's-foot dactylis, or rough Cock's-foot (*Dactylis glomerata*).—Various opinions, unfavourable to the culture of this grass, have been held by eminent botanists and agriculturists, as being a very coarse, common grass, unfit for meadows or pastures, and rejected by cattle of every description. It is, however, in every point of view, worthy of being cultivated in a separate state, on account of its uncommon luxuriance; being refused by cattle only when growing on rank soils, or in coarse patches. Mr. Pacey, of Northleach, Gloucestershire, has not omitted to notice the valuable properties of this grass: he has sown it largely when laying down his lands. It is permanent: his cattle are very fond of it; and never reject it but in that rank state of growth in which all other grasses seem to be disliked by them. It is a very general inhabitant of our pastures, rejecting only the extreme, not flourishing in very wet or very arid soils; it affords an abundant crop, springs early, and grows fast, makes excellent hay, and yields abundance of seed, which is not easily shaken out *. It flowers in June; and, if cultivated alone, should be cut early, in which case it will fully repay by producing an increased quantity of after-grass, as it is the first to appear after the mowing of meadows.

14. The Blue Dog's-tail Grass (*Cynosurus cæruleus*).—This grass, according to Mr. Curtis, is the earliest of all the British grasses, and flowers a fortnight sooner than even the sweet-scented spring grass. It grows naturally on the tops of the highest lime and stone rocks in the northern parts of Great Britain. The blue dog's-tail is not very productive: but Mr. C. thinks it may, perhaps, answer in certain situations, especially as a grass for sheep. It endures the summer droughts remarkably well.

* Tollet, in Communications to the Board of Agriculture, Vol. III. p. 452.

To these must also be added some aquatic plants; as—

1. Flote-fescue, (*Festuca fluitans,*) vegetates in yet moister situations than the flote fox-tail; and may indeed be said to be amphibious, as it sometimes grows in the water, and sometimes in moist places on land. This grass flowers in June, and is a constituent part of the celebrated Orcheston meadow: horses and cows eat it with such avidity as often to endanger themselves to obtain it. It springs early, and promises to be useful for the same purposes as the flote fox-tail *. The hay is soft, but good, and when made in the sap, is of a blueish-green colour, and grateful to all cattle, as is the grass when uncut, being always cropped on the ground. The Cheddar and Cottenham cheeses, in a great measure, derive their celebrity from this grass. These remarks are in every respect applicable to—

2. The Water Hair-grass, (*Aira aquatica,*) which is further said to contribute much to the fine flavour of Cambridge butter, and consequently deserves to be better known. It is generally found on the edges of pools and standing waters, where it flowers in June and July.

3. Flote fox-tail, (*Alopecurus geniculatus,*) grows in meadows on the banks of the Severn, in places so liable to inundation, that the other good grasses are expelled; and also in the moister parts of meadows, the hay of which is much esteemed for feeding cattle. It flowers in May and June, and promises to be a useful grass for newly-reclaimed morasses, or lands recovered from the sea †. It is a creeping plant, never rising high, but growing from the centre in a position nearly horizontal, the lower joints always touching the ground; and it may be propagated by slips. It is easily distinguished by its leading joints, light-coloured green leaves, and small round ear ‡.

4. Water-poa, or Reed Meadow-grass, (*Poa aquatica,*) "is one of the largest and most useful of British grasses, and forms a chief part of the riches of Cambridgeshire and Lincolnshire, and other counties, where draining the land by means of windmills has taken place. Immense tracts, that used to be overflowed and produced useful aquatics, but which still retain much moisture, are by the above process spontaneously covered with

* Tollet, in Communications to the Board of Agriculture, Vol. III. p. 437.
† Ibid. p. 436.
‡ Statistical Survey of the County of Antrim, part I. p. 250.

this grass, which not only affords a rich pasturage for the cattle in summer, but forms the chief part of their winter fodder."* From its strong stem and upright growth, it is calculated to remain unhurt by inundations, and is suited to those low places which are so liable to inundation as to be unfit for the finer grasses. It has a powerful, creeping root, and will admit of frequent mowing: it flowers in July and August†. This grass is particularly abundant in the Isle of Ely, where it attains the height of six feet, though it is usually cut when about four feet high; after it is dried, it is bound up in sheaves, then formed into ricks, in which it undergoes a slight degree of fermentation, that improves it. In this state it is provincially called *white lead*, from its acquiring a white surface when dry: the inhabitants of Ely also term it *fodder*, by way of eminence, other kinds of coarse hay being denominated *stover*. It is excellent food for milch cows, but is not relished by horses‡. By cutting it into chaff, Mr. Tollet thinks it will prove good winter provender§.

CHAPTER III.

ON ARTIFICIAL GRASSES, OR GREEN CROPS.

In the course of the present work we have stated the various modes of consuming grasses to the most advantage; in the present chapter, therefore, it is proposed to give a concise notice of the best artificial grasses, or vegetables cultivated and considered in that light, and which are every way worthy of attention, from their tendency to promote the thriving and fattening of cattle.

* Curtis's Flora Londinensis.

† Sole, in Letters and Papers of the Bath and West of England Society, Vol. IX. p. 152.

‡ Ibid.

§ Communications to the Board of Agriculture, Vol. III. p. 437.

I. Among these, CLOVERS have been the longest known to our agriculture, and are the most extensively used both for hay and green food.

There are four species of clover usually cultivated, each possessing various degrees of value, but all of which are more or less useful in feeding cattle.

1. White or Dutch Clover, (*Trifolium repens,*) is by no means a lasting plant on wet or swampy, loamy, or clayey soils; but on dry sandy loamy soils it will thrive with great luxuriance, especially if it be often rolled. This sort is preferred for sheep-walks, and when closely fed down is of very great utility; it is usually sown with red clover, ray-grass, or barley, and on dry soils produces most excellent hay.

2. Red perennial Clover, or Cow-grass, (*T. medium,*) better known by the name of marl-grass, continues longer in the land than the common clover, and vegetates spontaneously on marly soils; though it has been cultivated with the happiest success on sandy loamy and heavy clayey lands. The time for sowing it is from the middle of April till the second or third week in May. This sort, as well as the common clover, is sometimes sown with flax on very highly cultivated soils; and, as flax is a forward plant, it may in general be removed sufficiently early to allow the clover time for growing. Red perennial clover, however, rarely succeeds when sown by itself, as it will not withstand the severity of winter without some kind of shelter. It produces abundance of seeds, which may be easily collected, and is frequently employed for laying down land to grass.

3. Hop-clover, or hop-trefoil, or black nonsuch, (*T. procumbens,*) grows naturally in dry meadows and pastures, and flowers in June and July. It has been strongly recommended to the attention of agriculturists for laying down land to grass: when mixed with the preceding species, on light soils, it affords a most excellent fodder.

4. Common Clover, (*Trifolium pratense,*) flourishes best on firm soils, and is obtained by sowing seed, in the ratio of ten or fifteen pounds per acre, at various intervals between February and May. It is either sown in conjunction with spring corn, or (which is better on grass farms) with ray-grass; and, if it be mown when the ray-grass is coming into blossom, the lower growth will be materially increased, and a very considerable quantity of excellent grass be obtained; beside which the

clover will be effectually sheltered by the rye-grass from the consequences of severe frosts. The common clover is in flower from May to September, and the ripeness of its seeds may be easily ascertained by the stalks and heads changing colour.

II. LUCERNE, (*Medicago sativa,*) is of French growth, but was introduced into British husbandry about the middle of the seventeenth century; it flourishes most luxuriantly in deep, rich, friable loams, though it will also thrive in any good, dry soil; but the land must be kept as free as possible from weeds, otherwise its luxuriant growth will be greatly impeded. In order, therefore, to clean the land, two successive crops of turnips or carrots have been recommended as the most successful preparatory step; but, in case a fallow be preferred, it will be necessary to give the soil three ploughings, and as many harrowings, in the second spring, before the lucerne is sown, that it may become as fine as possible. The manure, which should consist of a rich and rotten compost, ought to be well mixed with the soil, before the sowing; and, if a previous crop of turnips be taken, it should be then laid on, by which means it will become incorporated with the soil, and will not occasion that premature rankness in the early plants which is not unfrequently followed by early decay. Top-dressings should be applied at the future stages of its growth, and wherever the plants fail, their places should be supplied by transplanting.

Lucerne may be either broad-cast or drilled, or propagated by transplanting; all of which methods have been successfully practised. The proper season is towards the middle or end of March, or not later than April; because, like the turnip, lucerne is subject to the ravages of the fly, and by early sowing it will attain a sufficient degree of growth, so as not to be affected by the devastations of the insect. If broad-cast, twenty pounds of seed (which should if possible be *new*) will suffice for one acre; if drilled, six pounds will be enough if the seed be deposited in equidistant rows of two feet. The value of the first lucerne crop will be greatly increased by sowing it with oats in the proportion of six pecks of the latter per acre for very rich land; of two bushels for indifferent soils; and of three bushels for poor soils; but the subsequent crops are apt to suffer from the admixture. As soon as the grain is sown and harrowed, the lucerne should be sown, and a light harrow be passed over it, whether drilled or broad-cast. Where, however, lucerne is

sown with the view of being transplanted, the seed should be deposited in the ground early in the spring *alone*, and be carefully hand-hoed till August, when the sprouts will be sufficiently large to be transplanted; after which they will require but little attention till the following year, excepting that it will be advisable to hoe the transplanted crops once or twice during the intervening period.

The first use of lucerne is for soiling horses, or other cattle, from three to five of which may be supported by the produce of an acre during the six summer months; the lucerne being cut twice a day, and given to the cattle in a fresh state. This plant is also well calculated for fattening bullocks: the experiments made with this view, indeed, are not numerous, though they evince that lucerne is, in this point of view, far superior to tares. It has also been successfully employed in soiling sheep and hogs; and, as the latter do not feed down so closely as the former, they may be admitted upon lucerne plantations with safety. Lucerne is also made into hay; but this management is less profitable than that of soiling cattle with it in a green state. Where, however, it is to be made into hay, it should be so cut, and the swaths so exposed as to dry quickly without shaking about more than is necessary; as the leaves will be less liable to be separated from the stems, and the hay will consequently be of more value.

III. SAINTFOIN, (*Hedysarum onybrychis*,) vegetates, with uncommon luxuriance, on dry chalky soils, where it flowers in June and July. The best seed has a bright husk, the kernel being plump, externally of a bluish or gray cast, but, when cut, internally of a fresh greenish colour.

Saintfoin requires a clean soil; the seeds should be *fresh*, and sown towards the close of February, or early in March. The quantity varies from four to eight bushels per acre, broad-cast, according to the nature of the land; though four bushels are, in general, fully sufficient: in the drill-culture three bushels are enough. Saintfoin, indeed, is sometimes sown with barley, as with clover, in the proportion of from one to three bushels per acre, with the addition of five pounds of *trefoil*, which last is said to check the growth of weeds till the saintfoin has taken deep root. This, however, is an injudicious practice, as the corn injures the plant; but as saintfoin does not yield a full crop until the third or even the fourth year, it is advisable to sow

clover along with it, which will rather assist its growth, and will disappear in time to allow of its taking full possession of the soil. During the first year, no cattle ought to be allowed to graze on it, as their feet will injure it; nor should it be fed down by sheep the succeeding summer, as they are apt to bite the tops of the roots, the growth of which would be immediately checked. In the following summer, a crop of hay may be made, and the after-math fed down with cattle of any description, excepting sheep, for the reason above assigned. At the end of seven or eight years, the soil should be manured with dung, or, if it be sandy, with marl, and, with proper attention, it will last from ten to fifteen years.

In case the first season for mowing prove wet, the saintfoin ought to be left for seed. Considerable judgment is requisite in making it into hay, for if it be cut before it is in full bloom, the quality of the hay would thus be materially injured; and, if allowed to stand long after that period, it becomes stalky and tough: it dries rapidly, and, in fine weather, only requires once turning in the swathes. If cut and given to cattle in a green state, it would produce a second crop in the same year. This plant is chiefly consumed in the form of hay; but, whether thus used, or employed in soiling, it is, from its great succulence, equally valuable for feeding cattle, and especially horses, which are asserted to be materially strengthened by it, without the aid of oats. It ought, however, to be remarked, that saintfoin, though it increases the quantity, does not, in the opinion of some farmers, improve the quality of milk in cows; while by others it is asserted, not only to make the cream richer, but also to give the butter a better colour and more delicate flavour.

Swampy soils are by no means congenial to this plant; the most appropriate is a calcareous porous earth, into which it may push its long tap-roots to a great depth; but, as there are numerous dry stony wastes on which it will grow, it certainly deserves to be more generally introduced into culture, especially as it will produce, on the worst lands, at least one ton of hay, together with a considerable after-math.

IV. Bush-vetch (*Vicia sepium*).—This vegetable grows in woods, hedges, pastures, and meadows, and flowers in May and June. It does not attain any great degree of height, seldom rising to four feet; but, as it possesses the valuable

property of speedy growth after being cut, it promises to be a useful plant for pastures. It shoots earlier in the spring than any other eaten by cattle, vegetates late in autumn, and retains its verdure throughout the winter. The culture of the bush-vetch was recommended by Dr. Anderson * so long ago as in 1774, though it has not been much practised since that time, principally from the difficulty experienced in collecting the seeds; as the pods burst and scatter them about, and the seeds are frequently devoured by the larvæ of a species of *catelabus* †. From experiments that have been made in regard to the culture of the bush-vetch, it is certainly worthy of trial. A small spot of garden-ground was sown with the seeds of this plant in drills, and Dr. Withering states, that it was cut *five* times in the second year, when it produced at the rate of twenty-four tons per acre of green food, which would be nearly four tons and a half when dried. From an experiment likewise recorded by Mr. Swayne ‡, the produce of the hay, in part of a field wherein the bush-vetch naturally abounded, was twenty-four tons eleven hundred-weight and three-quarters per acre, which is upwards of one-third more than is generally yielded by lucerne §.

V. BURNET (*Poterium sanguisorba*).—This vegetable is chiefly used for early sheep-feeding, though it may also be cultivated with great advantage for soiling cattle. It is very hardy, being little affected by droughts in summer, or by severe frosts in the winter, and will even vegetate in that season. If it be reserved for the purpose of making hay, though its produce is in general abundant, it ought to be cut early, otherwise it will become coarse. In the culture of this plant, it is of great importance to have good seed, for which purpose a proper spot should be selected; and as the seeds shed when ripe, they ought to be cut in the morning while they are moist with the dew, and thrashed out on the same, or on the following day. Those who wish to save the seed should, according to Rocque, who first introduced the culture of burnet, feed the grass till May, otherwise it will be too rank, and lodge. Burnet flourishes best on dry soils, and may be sown in April, May, June, July, and

* Essays on Agriculture, Vol. II.

† Withering's Botanical Arrangement of British Plants, Vol. III.

‡ Letters and Papers of the Bath and West of England Society, Vol. III.

§ Ibid.

August: for *sheep-pastures* it should be broad-cast, or sown with the hand: for other purposes, it may be advantageously drilled. During the first year, it will require to be kept very clear from weeds, which may be effected by harrowing; for, being a strong, tap-rooted plant, the teeth of the harrow will not injure the roots: and in the second year it will become sufficiently strong to choke all other grasses. The advantages of burnet to a stock-farmer, from its hardiness and early growth, are very great; but although cattle will eat it greedily at a season when there is no other green food, yet they do not give it a preference; and therefore, where it is intended for hay, or summer pasture, it should be sown with a proportion of white clover, which will both render it more palatable, and afford a heavier crop than if sown alone.

VI. CICHORY, (*Cichorium intybus*,) also called Common Wild Succory, is a vegetable, the value of which, for feeding cattle, has only been known within a few years. It was introduced, from France, by the late Mr. Young, but is indigenous in this country. On blowing sands, or weak and poor soils, it has been thought superior to any other plant; and if it be sown with a portion of burnet and cock's-foot grass, it will form a layer for six or seven years, far exceeding those made with trefoil, rye-grass, and white clover. The best seed is undoubtedly that which is obtained by the farmer from the plants themselves; and, as they produce seed in great abundance, it may be easily collected by hand: but the mode of sowing varies according to the intention for which it is raised. Thus, for feeding cattle, it is usually sown in conjunction with oats, or other spring corn, at the season the latter is usually deposited in the ground; but for soiling it is sown alone, from the second or third week in March till the close of summer, the earlier the better, on account of the hardy nature of this herbaceous perennial; in general, the seed is sown broad-cast, though perhaps, on poor land, it would be better drilled in rows about nine inches, and on better soil at twelve inches, asunder, after the soil has been duly pulverized; when sown, it only requires to be once lightly harrowed; but, if drilled, will be greatly improved by an occasional scarifying. The quantity usually sown is about ten pounds per acre: it thrives on any soil, but the crop is uncertain.

Cichory is extremely luxuriant, far exceeding the produce of

burnet, lucerne, or saintfoin, and therefore will admit of being often cut for soiling during the summer. For the first year, one or two cuttings or mowings will be sufficient; which may, in subsequent seasons, be repeated three or (Mr. Y. says) four times, beginning in April or May, and cutting every second month till October*. This plant also may be made into hay, which, though coarse, is said to afford considerable nourishment; but its chief use is for soiling cattle during the summer months; and it is likewise excellent for sheep-feeding, receiving less injury from hard stocking than many other vegetables. The culture of cichory has been carried on to a considerable extent by the late Duke of Bedford, and by Messrs. Martin, Wakefield, and A. Young, sen. of whose interesting experiments we regret that our limits will not allow a detail†. Its culture has, we are informed by an intelligent American agriculturist, been likewise strenuously recommended to the notice of farmers in the Western Hemisphere, though we have not yet heard with what degree of success, or to what extent it has been practised.

VII. SPURREY (*Spurgula arvensis*).—The common, or corn spurrey, is an indigenous vegetable, flourishing in corn-fields and sandy situations, where it flowers from July to September. Its culture has hitherto been but little, if at all, practised in this country; though, from the avidity with which it is eaten, it deserves to be more generally known, being peculiarly calculated to fatten sheep, as also to increase the milk of cows. Further, spurrey continues green till a late period in autumn, and often throughout the winter, on which account it has long been cultivated in Flanders; we have therefore been induced to recommend it to a fair trial by practical agriculturists. In that country it is sown immediately after wheat, by one ploughing of the stubble, and soon affords a tolerable pasture for cows; but it is said to produce an unpleasant effect on the butter.

VIII. TARES (*Vicia*).—There are two varieties of the common tare, (*V. sativa,*) called the *spring* and *winter* tares: the former of which is less hardy than the latter. The spring tare is usually sown about the end of March, or early in April; and

* Annals of Agriculture, Vol. XX.

† See Annals of Agriculture, Vols. XV. XVII. XX. XVIII. where numerous valuable accounts of the culture and applications of this plant are given.

the winter tare in September, (the earlier the better,) in the proportion of from eight to ten pecks per acre, broad-cast: for the drill culture, half that quantity will be sufficient. Both these varieties are of very essential service in soiling cattle of every description; especially the winter tare, which comes into use just as the turnip-crops fail, and affords a succulent food to ewes and lambs. Tares are rarely made into hay, on account of the great loss they are liable to sustain from wet, as well as on account of the more than usual care requisite in the making. In some counties the winter tare is cultivated as pasturage for horses, and is eaten off so early as to admit of turnips being raised the same year. They produce abundance of seed, which the farmer will do well to collect, and keep separately, from the great resemblance which the seeds of the two varieties bear, so that they are liable to be often mixed.

There are a few other species of tare, or vetch, worthy of the agricultor's attention, namely—

1. The Strangle Vetch, or Tare, (*V. Lathyroïdes,*) which abounds in chalky and sandy soils. It affords a tender and agreeable food to sheep.

2. The Tufted Vetch, (*V. cracca,*) attains a considerable height, and produces abundance of leaves. This sort, which flowers in July and August, as well as the wood vetch, (*V. sylvatica,* which rises from two to four feet high,) is said to restore weak or starved cattle to their strength more speedily than any other vegetable hitherto discovered.

3. The Broad-leaved Vetchling, or Everlasting Tare, (*Lathyrus latifolius,*) has hitherto been raised in gardens, chiefly for the sake of the fine flowers. It often attains to the height of ten or twelve feet, and produces abundance of foliage. It is eaten most eagerly by cattle, and was several years since recommended to the attention of farmers by Dr. Anderson, as promising to afford a large crop of hay; though it appears hitherto to have met with little notice, in an economical point of view.

CHAPTER IV.

ON THE GRAIN AND PULSE COMMONLY USED AS FODDER.

I. OATS (*Avena sativa*, L.).—The common oat, of which there are several varieties, all eminently calculated for cold, poor, and dry soils, as well as marshy ground, or land newly broken up.

1. The red or brown oat ripens early, and does not shed its seed: it is very useful for feeding cattle, as also is its variety, the Peebles oat, which will stand on any exposed or mountainous districts, without being injured by the severity of the weather.

2. The white oat also attains early to maturity; there is also a variety, called the Angus oat, which, though less forward in ripening, requires a drier soil than either of the preceding. Or,

3. The black oat, which is a long, heavy, and hardy sort, particularly good for horses, and which is chiefly cultivated in North Britain.

All these varieties are raised from seed, the proper season for sowing which is from the middle of February to the commencement of June; the quantity per acre, if sown alone and broadcast, being from three to six bushels, to which are sometimes added one bushel of darnel or rye-grass, and twelve pounds of clover. The seed is then harrowed in, and requires but little subsequent management. Oats may likewise be advantageously drilled, though this practice, as far as respects them, has not hitherto been carried on to any great extent. Beside the indigenous varieties already noticed, there are a few foreign species worthy of notice, and which will withstand the severity of a variable climate, namely—

1. The Poland oat, together with its variety, *Church's oat*, first raised in Scotland, require a very rich soil; both ripen early, and easily part with their grain when ripe: the quantity sown is seven or eight bushels per acre, in March or April.

2. The Friesland oat, to which the same remarks apply: the

quantity per acre is about six bushels. These two species are raised chiefly for feeding horses.

3. Skegs, (*Avena stipiformis*, L.,) will vegetate luxuriantly on the poorest soils. This species is said to be a very wholesome food for, and is much relished by horses, cows, and ewes before they yean their lambs, especially when given with the straw, either in a whole or in a chopped or bruised state.

Oats are liable to the *smut*, a disease common to most kinds of grain, and which is believed to originate from the depredations of an insect. The most likely preventive is, to wash the seed gradually and repeatedly in a sieve, in running water, till all the light grains are separated; or, it may be advantageously steeped in diluted vitriolic acid, in the proportion of one gallon of the acid to about thirty gallons of water. They are likewise subject to the depredations of a grub which begins its ravages early, and continues till May or June, when it is transformed into a chrysalis, and at which time only it is vulnerable. At this season the refreshing vernal showers destroy immense numbers; in fact, all but such as may have taken shelter in the coarse and luxuriant weeds usually found in ditches and on banks, or in soft and dry mole-hills, whence the eggs of the vermin are conveyed by the air or wind into the field. The only probable preventive is to remove all such rubbish from the vicinity of the oat-field; and, consequently, the insects, being deprived of their shelter, will be exterminated by the winter rains.

II. RYE, (*Secale cereale*, L.,)—Of the common rye there are two hardy varieties, spring or white rye, and winter or black rye, the former of which may be sown from February to March, and the latter from the middle of September to the close of October. The quantity of seed per acre is from two bushels to two bushels and a half, Winchester measure, on poor, sandy, or dry limestone soils. Rye may likewise be harrowed in with a thin crop of turnips, and both be fed off with sheep. Either for pasturing or for soiling, rye supplies an excellent article of food to sheep as well as to horses and cows; the former may be fed off with it in the spring, the latter somewhat later. It is not, however, cultivated to any considerable extent, from its being liable to the depredations of an insect, that causes it to become horned or spurred, in which state it is very pernicious to cattle.

III. BUCK-WHEAT, (*Polygonum fagopyrum*, L.,) vegetates with great luxuriance in dry, loose, and sandy soils, that are open to the effects of the sun; though the variety known by the name of Siberian buck-wheat, which is much heavier and more palatable in the grain, will thrive in the poorest soil, and is not at all affected by cold. The best, and indeed the proper season for sowing it is towards the end of May, or the commencement of June; and, in the course of a week, it generally appears above the ground: the quantity is from one to three bushels per acre. Buck-wheat requires little or no manure, and affords an excellent food, either for soiling or for winter store. Given to horses employed in slow draught, in conjunction with bran or chaff, whether the seeds be in a whole state or bruised in a mill, it will put them into fine condition; and, if given to cows, in a recent or green state, it greatly increases the quantity of milk. The seeds of the buck-wheat are excellent for fattening poultry and swine; but the last mentioned animals should, if possible, be kept from eating the whole vegetable, as it is asserted, not only to *intoxicate* them, but also to cover them with scabby eruptions. The peculiarly fine flavour of the poultry in the south of France is said to be derived from this grain; but its fattening properties are not equal to those of the corn in common use.

IV. PEAS, (*Pisum sativum*, L.,)—There are many varieties of peas cultivated, which it is not necessary here to specify; as the principal sorts for field-culture may be reduced to two, the *white* and *gray*. The proper season for sowing the white pea is from the end of February to the first or second week in March, in a light soil, with about two bushels and a half of seed for the large sort; the gray pea, from the end of January to nearly the middle of March, on a strong soil, with about three bushels of seed per acre. The drill-husbandry is most easy and certain; and the seed should be put in double rows, about fifteen inches asunder, with an interval of about thirty inches' distance between the double rows. The wide intervals should be cultivated with a small plough, or cultivator, the narrow ones with a hand-hoe; and when the plants are advanced, and before they fall down, (for peas, being weak, climbing plants, are liable to fall on the ground according to the common broad-cast husbandry,) by earthing up the rows a little, they will lean towards each other, unite and form one row, and thus be supported, so as to blow and form their pods without falling on the ground.

The distances here specified are calculated for the earlier and smaller sorts of peas; the larger kinds will require more room between the double rows. It should be observed, that one-third less of the quantity of seed above stated will suffice for the drill-culture; but, as peas are liable to be worm-eaten, especial care should be taken to sow only good, sound seed, otherwise the crops will of necessity be scanty and indifferent in quality. This kind of pulse may be sown after turnips or clover, upon one ploughing; but are best after a winter fallow, and the land in good tilth. When peas are cut, they should be laid in small heaps, and be frequently turned with a fork, being very apt to receive injury, and sprout by lying on the ground, without being often turned; and great care is necessary in turning them, to prevent the pods from shedding.

Peas are chiefly used in fattening swine; and, when bruised and given to cows, in conjunction with other succulent meal, they are said to give a flush of milk. Their haulm, if carefully gathered in a favourable season, affords a wholesome fodder to neat cattle, and is particularly relished by sheep; it is also usefully given, as rack-meat, to farm horses, and thus saves a large consumption of hay.

V. BEANS. The sort of beans usually cultivated for feeding cattle is the Horse-bean, (*Vicia faba equina*, L.,) of which there are several varieties; the large ticks or *negro* beans, the small ticks, and the common sort. They will all grow under the same system of culture, only requiring more or less room, according to their size. Beans are more hardy than peas, and also a more certain crop; but they require a stronger soil, and it ought to be well manured for them. They may be cultivated in the same manner as peas, and likewise on three-feet ridges, and thus they are easily kept perfectly clean with the horse-hoe and hand-weeding; hoeing the ridges alternately. This is a much better and cheaper way of cultivating beans than the common way, upon the level ground. The quantity of seed necessary is about a bushel and a half of common beans upon an acre, which should be drilled about four inches deep, the latter end of January, and thinned to about three inches distance in the rows, leaving the most promising plants. Or they may be dibbled; in which case less seed is required, and the plants come up more regularly than when drilled. They should be frequently horse-hoed, and near to the plants; and the slips of earth left next to the rows by the hoe-plough should

be hand-hoed, and the rows hand-weeded. Thus great crops may be obtained from the common sort, and the land brought into fine order. There is a further advantage in this way; that less manure is necessary to a crop of beans, thus cultivated, than if planted upon the level and hand-hoed. The sun and air are likewise more freely admitted among them; and, as they do not grow so tall as when close-planted, they blossom and produce pods almost down to the ground; whereas the tall close beans produce them only near the tops of the stalks. The close-planted are also infested with the dolphin-fly, but not those which are drilled on ridges.

VI. LENTILS, (*Ervum lens*, L.,) may be sown in the quantity of one and a half or two bushels broad-cast; or they may be drilled in rows eighteen inches asunder, for the convenience of cleaning the intervals with the Dutch hoe. Sometimes the lentil is put in the ground with the proportion of two bushels of oats, or one bushel of barley: but whether thus cultivated, or grown alone, they ought to be cut while in full sap; because, when well dried and preserved, they afford a wholesome fodder to cattle, especially to cows; the quality and quantity of whose milk they materially increase; and also to swine, which will very speedily fatten on them.

CHAPTER V.

ON THE VEGETABLES BEST CALCULATED FOR ANIMAL FOOD.

HAVING already pointed out the various modes of producing and consuming crops of grain and pulse, by way of fodder, we now proceed briefly to state the culture of such plants as are peculiarly calculated to supply the farmer with sufficient food for his cattle stock during the trying season of the year.

I. Of the roots which form the subject of this chapter, that which claims the most immediate attention, both from its general importance to the farmer, and from its extensive use in the feeding of stock, is the TURNIP. The varieties of this root, most commonly cultivated for feeding cattle, are the *Norfolk*, or oval, common white stock; and the *Ruta baga*, or Swedish turnip, which is a very hardy, succulent vegetable, much re-

lished by cattle, and is in no respects injured by the severest winters. These roots will be reared to most advantage on light soils, consisting of loam and sand mixed together: the seed is sometimes broad-cast; but repeated experiments have shown that it is far better to drill the seed, in which case one pound will be sufficient, whereas the broad-cast method will require three pounds. The soil ought previously to be rendered as fine as possible; and if soot be applied by way of manure, it will, it is affirmed, effectually prevent the ravages of the *fly*. The time of sowing depends on the season of feeding cattle off with turnips: thus, for winter consumption (i. e. from December to February) the seed should be sown from the middle of May to the close of June; for spring feed (i. e. from February till May) the end of July or beginning of August will be sufficiently early. But the seed ought to be changed every year, or every second year at the furthest, as the turnips will otherwise degenerate; and it should be deposited at the depth of two and a half or three inches, in order that it may have the greater moisture, and in consequence vegetate so rapidly as to be speedily out of the reach of the fly *.

When turnips have five leaves, it will be proper to hoe them, (in which operation the hoes already described †, may be effectively employed,) and afterwards to thin them out to the distance of six inches asunder, which operation should be repeated in the course of three or four weeks, or even earlier, if the weather be wet, and the turnips be then thinned to the distance of fourteen inches apart. The success of their growth also depends greatly on the removal of all weeds, for which purpose a horse-hoe will be found very useful: sometimes, however, it happens that, notwithstanding every attention that may be bestowed on the culture of turnips, several spots will remain barren and unproduc-

* See figures and descriptions of two excellent turnip-drills, Book VII. Ch. VII

† Ibid.

tive. To remedy these inconveniences, the implement represented in the opposite page was invented a few years since, by Mr. Cubitt Gray, an intelligent Norfolk farmer. The method of using his transplanter is as follows: the handle A is to be held with the left hand, and the short handle B drawn up with the right. The implement is then to be put over the root intended to be transplanted, and forced into the ground with the foot; then after twisting it round, it should be carefully drawn up, so that the soil may adhere to the root. In the mean time an attendant, likewise furnished with a transplanter, should make a hole for receiving the turnip, which is to be conveyed thither in the first transplanter; and, the right hand being kept steady while the left is gradually raised, the root will be left in the hole undisturbed *.

Having, in the former part of this work, detailed various modes of consuming turnips in feeding cattle-stock, we shall conclude this outline of their culture with a brief notice concerning the depredations of insects, and diseases to which they are peculiarly liable.

1. The *anbury* is a large excrescence, which forms itself below the apple. It grows to the size of both hands; and, as soon as the hard weather sets in, it attains to maturity, becomes putrid, and emits an offensive odour. The cause of this disease is not known: some Norfolk farmers, indeed, attribute it to the too frequent culture of turnips on the same land; but this idea is positively denied by Mr. Marshall, who inquires whether it is not caused by the devastations of a grub, that, wounding the vessels of the tap-root, diverts the course of the sap, which, instead of forming the apple, forms this excrescence. Should this conjecture prove correct, the depredations of the worm may probably be prevented by putting soap-boilers' ashes, by way of manure, a short time before the seed is drilled.

2. The *black canker* is a species of catterpillar, thus denominated by Norfolk husbandmen, which commits very great devastations among turnips, when the plants are in the state of growth termed *rough leaf*, that is, have formed considerable tops. One method of destroying these in-

* Bath Papers, Vol. IV.

sects is, to turn a flock of ducks into the field infested with them. This expedient was successfully adopted in 1784, by Mr. Coke, of Holkham, who purchased 400 ducks, and turned them on thirty-three acres of turnips, which they effectually cleared of the canker-caterpillar in the course of five days. Rolling has been also used with various success. As a preventive, indeed, we know of no certain expedient, unless perhaps the sowing of turnip-seed on land so highly manured as to advance the growth of turnips quickly into the state of rough leaf long before the insect makes its appearance.

3. The *fly*, or black fly, (*Crysomela oleracea*, vel *nemorum*, L.,) ravages chiefly the tender seed-leaves of young turnips, and, if not timely prevented, will completely destroy them. The sowing of turnip-seed between beans has been suggested as a preventive; as also has the addition of one-fifth part of radish-seed, rolled into the ground. Radish-seed, however, is not in all cases a preventive, though we understand a Norfolk cultivator, some time since, received a handsome sum for divulging this remedy; for we have been informed that Mr. Dunning, of Blackwater, Hants, (deceased,) formerly an eminent coach-master on the western road, and also an intelligent cultivator, tried the experiment of radish-seed on seven acres of turnips, which were almost totally destroyed by the fly; while a contiguous field, which he had sown with turnip-seed and sulphur, escaped altogether unhurt. The proportion of flower of sulphur we would recommend, from experience of its good effects, is three ounces to one pound of seed, to be added in the following manner: put the seed and one ounce of sulphur into a glazed earthen vessel, and cover it closely down for twenty-four hours; at the end of that time, stir the mixture, and add a second ounce, covering it as before; and at the end of forty-eight hours mix the third ounce, carefully stirring the whole, that the seed may be properly impregnated with the sulphur. It is then to be sown in the usual manner, and will effectually keep off the vermin till the third or fourth seed-leaf is formed, which will acquire a bitter taste, and thus be secured from the ravages of the insect. Another efficacious remedy,

which was adopted by the late Lord Orford, is the steeping of the seed in train-oil the night before it is sown *; but, in this case, the seed should be drained from the oily fluid, and mixed with finely-sifted sand or mould. By this treatment the roots will not acquire any ill flavour; and seven gallons of oil will, it is said, be enough to steep seed for sowing 200 acres. It is probable that this steep may prevent the attacks of the black canker caterpillar. Quick-lime, finely powdered, and dusted over the seminal leaves of the turnips, as soon as the fly begins to threaten them, has been found a never-failing preventive of the depredations of these voracious insects †, even where soot manure has failed. Sir H. Davy thinks that the mixture of soot and quick-lime, and urine and quick-lime, will probably be more efficacious: the volatile alkali, given off by these mixtures is offensive to insects; and they afford nourishment to the plant ‡. The burning of weeds, or of damp straw, has also been found efficacious in keeping off the fly. A few heaps lighted on the windward side of the field, so that the smoke may pass over it, will have the desired effect.

4. Slugs are likewise great depredators on turnips; for extirpating which, some have recommended the rolling of the ground during the night, while these vermin are abroad; as also the strewing of the lime in the evening, or very early in the morning, at the rate of fifteen bushels per acre. Geese and ducks may, as in the case of the canker, be advantageously turned into turnip-fields; but the most expeditious means of destroying these vermin is the sprinkling of tar-water, by means of a watering-pot or other con-

* Annals of Agriculture, Vol. XIV.

† Gorrie, in Transactions of the Caledonian Horticultural Society.

‡ Davy's Lectures on Agricultural Chemistry, p. 320. Sir H. D. records a successful experiment of Mr. Knight's, with a composition, consisting of three parts of soot with one part of lime slacked with urine: it was put into a small barrel with gimlet holes round it to permit a certain quantity, about four bushels per acre, to pass out, and to fall into the dills with the turnip-seeds. Whether it was by affording highly stimulating food to the plant, or giving some flavour which the flies did not like, Mr. Knight cannot state: but in the year 1811, the adjoining rows were eaten away, and those to which the composition was applied, as above described, were scarcely at all touched.

trivance, on the land, before as well as after sowing, which will prevent their depredations; and which, if poured on them, will occasion instantaneous death. Captain Shank directs the tar-water to be made by pouring a sufficient quantity of tar into a barrel, and to fill it up with water, which, after standing two or three days, will become powerfully impregnated with the tar *.

As turnips are of such importance to the grazier, and breeder, the most effectual mode of preserving them becomes an object of considerable moment; we shall, therefore, conclude this notice of their culture with a concise statement of the best means of keeping these roots. In the county of Norfolk, Mr. Marshall has recorded an instance of successful invention, in the preservation of turnips. A farmer having a close of turnips, which he could not consume fast enough to be sown with wheat, cut off the tops with a spade, gave them to his cows, and carted the roots into an adjoining new-made ditch, backing the cart, and shooting them in; he then covered them with a little straw, and over this with bramble *kids*, or faggots, to keep the stock from them. Here the turnips continued till they were wanted in a frost; the roots in general came out as sound as they went in, and were eaten by his cattle as well as or better than fresh-drawn turnips. Had the tops been deposited with the roots, they would, Mr. M. observes, have produced a fermentation, and spoiled the whole deposit †. It is not improbable but that this practice may be extended to the preservation of turnips in the spring; but this management, it should be remarked, is only capable of being adopted in dry, porous, or sandy soils; in which, as suggested by an able agriculturist, pits or beds may be dug, about two feet in depth, and of a considerable breadth, in turnip-grounds, wherein five or six layers of turnips may be put, with a little fresh earth between each of them, the tops being covered with straw ‡. Further: turnips may be drawn, topped, and carted into a spot contiguous to the home-stead, where they may be stacked, without any loss of labour, by reason of the ready supply they would afford for shed or straw-yard bullocks §. Lastly, after drawing turnips in February,

* Shank, in Bath Papers, Vol. VIII.

† Marshall's Rural Economy of Norfolk, Vol. II. p. 109.

‡ Kent's Hints to Gentlemen of Landed Property, p. 121.

§ Marshall's Norfolk, Vol. II. p. 110.

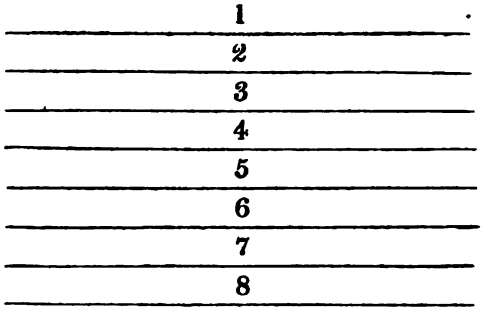
and cutting off their tops and tap-roots, (which may be advantageously given to sheep,) they may, if the weather be dry and open, continue on the soil for a few days; then let a layer of straw be spread on the ground, and on this be placed a bed of turnips, about two feet in thickness. These alternate strata may be carried up gradually to a point, to prevent the roots from rolling out; next, let the whole be thatched with straw, one load of which will be sufficient for forty tons of roots; and these will be effectually preserved for many months uninjured by frost or snow.

The following method has likewise been very successfully employed by Mr. T. C. Munnings, whose valuable turnip-drill we have already noticed. Having observed, that the drill-system alone could facilitate the protection of the turnips while on the land where they were grown, Mr. M. states that, in 1800, he at length effected this desirable object, by removing the *alternate rows for autumnal consumption;* thus leaving rows about one yard asunder, and then with a one-horse plough moulding up the same. His land thus assumed the appearance of what is called *two-furrow work*, or perhaps, more properly, *tops and balks*, each top embracing and defending a row of turnips, and the balks being in the lines from whence the turnips were removed: the whole were most completely moulded up, and seemed to bid defiance to a winter's severity *.

So completely has this plan answered, that Mr. Munnings affirms, that, if any individual will contrive to mould up his turnips in the autumnal months, before the severe frosts set in, such turnips will be so much better than those which have received *no* artificial protection, as will abundantly compensate the extra care or labour thereby occasioned.

The following is the method Mr. Munnings most decidedly approves, to which he proposes in future to adhere, and which he recommends to general notice:—"Suppose the following eight lines, No. 1, 2, 3, &c., to represent my rows of turnips on a ridge—*eight* being the most convenient number of rows for the easy execution of the work:—

* For this fact, as well as the following statement, we are indebted to Mr. Munnings's interesting Account of some Experiments for drilling and protecting Turnips, &c. 8vo.



"Conceive half of these lines to be upon one ridge, and half upon another; in that case there will be a furrow between 4 and 5—this furrow is to be opened with a double-breasted plough, which will raise mould for the protection of what I will call the insides of those two rows, 4 and 5; the rows, 1, 2, 3, are then to be pulled and put into the open furrow, (between 4 and 5,) with their tops inclining towards 4. In the same manner the rows, 6, 7, 8, are to be pulled, and put into the same furrow, with their tops inclining towards 5. Two or three furrows are then ploughed with a one-horse plough to the outsides of 4 and 5, and some mould from the third furrow so ploughed, shovelled unto the top of the collected rows, (of this shovelling I think, from what I had done, that a good labourer will finish two acres in three days,) and with the one-horse plough, the ploughing may then be finished, so as to give the land a complete earth.

"By this plan the whole of eight rows are collected into a small space; and if the frost be very severe, and other turnips (unprotected, or protected but in single rows) be difficult of access, the land being kept open by the tops of four rows united in the lines 4 and 5, may most easily be removed from the top of them, and the whole body of the turnips so collected will be found unfrozen. From turnips thus defended, I sent specimens of unfrozen roots and very lively tops to many gentlemen and farmers during the most severe days of the frosts of the winter just past, at a time when other turnips, not protected, were as hard as stones. I sent specimens to many market-rooms of farmers, to show, from time to time, the validity of my plan; and from beds of turnips thus defended, I have no hesitation in saying, that one man may, with ease, feed more stock with sound,

uninjured food, than five men possibly can from any crop of broad-cast unprotected turnips."

II. Of nearly the same value as turnips, for sheep-feed, is RAPE; the culture is similar; and it will support about the same number per acre. It has the further advantage, that it may be sown later than turnips; where it is an object to obtain two green crops in the year, it, therefore, affords a longer time for eating off a previous crop of winter tares; and it will succeed even after an early corn crop. If sown for seed, it requires a rich soil; but large quantities are grown, with advantage, for feed only, on very poor land, in many parts of England, particularly on ground newly broken up. When intended for autumn feeding, the sowing takes place in the course of May.

III. Of POTATOES, (*Solanum tuberosum*, L.,) there are several varieties cultivated for culinary purposes only, while others are raised solely for the purpose of feeding cattle-stock during the winter, for which purpose these roots are admirably calculated when properly sliced and steamed; of this last description are the Surinam or hog-potato, the Howard or clustered potato, the ox-noble, red, and Irish purple potatoes. All these sorts flourish with great luxuriance in light, loamy, sandy soils; though they will grow in any tolerable land. The ground ought to be previously ploughed twice or thrice, and just before the last ploughing, a good quantity of stable dung* should be spread, and ploughed down early in March, if the weather be open; but if it be frosty, that business should be deferred till the end of March, or the beginning of April. After the last ploughing, the ground should be levelled, and furrows be made about three feet asunder, and seven or eight inches deep. In the centre of these furrows are to be set the entire roots, eyes, slips, or rinds, (for all these have been successfully planted, and have produced excellent crops,) which should be covered with earth; and, a little before the young plants appear, it will be advisable to pass a light harrow over the whole, to eradicate all weeds, and remove every hindrance to their growth. As the potatoes increase, they should be

* From 15 to 20 cart-loads per acre are, in general, sufficient; *too much* dung prevents potatoes from becoming mealy, and they are in consequence liable to become waxy and watery.

earthed up twice, which operation will greatly promote their growth.

Potatoes are subject to various injuries from insects, as well as to various diseases, of which none is more fatal than the *curl*, so called from its causing the leaves of the plants to curl, though agriculturists are by no means agreed as to the cause of it. And, as it would lead us into a wider discussion than our limits will admit, we shall only state, that the steeping of the sets, for two hours, in a strong brine, made of Whitster's ashes, is believed to be a preventive; so likewise is the raising of potatoes from new seed, changing the seed, or renewing the same sorts again from the same seed. The proper time for digging up potatoes is in autumn, when their stems and foliage are beginning to decay; this operation should be done in dry weather, after which the roots may be piled up in dry spots, in heaps resembling the roof of a barn, and thatched with straw, slightly covering them with mould, which is beaten down with a spade. Holes are sometimes made in the sides and on the top, to afford a passage for the air arising from the natural warmth of the potatoes, which may be filled up as soon as the evaporation of steam ceases, in order to prevent them from being injured by frost or rain.

Besides their utility, when steamed, for feeding and fattening cattle in general, potatoes are particularly serviceable in fattening swine, though a little variation will be necessary in preparing the roots, where the animals are intended for bacon or hams; in which case equal parts of ground peas and boiled potatoes must be gradually mixed together; and it has been asserted, that *eight* bushels of the mixture will be sufficient to fatten an animal weighing *twelve* stone.

IV. The common white Beet, (*Beeta hortensis*, L.,) though chiefly cultivated in gardens for culinary purposes, is, according to Rocque, a most excellent fodder for cows; the best way of feeding them being, to mow the plant, and to give it to them during the summer. It is raised from seed, which should be sown in the beginning of March, on an open spot of rich ground in a low situation, and may be occasionally watered. As it is of essential importance to have the soil properly cleansed, three ploughings will be necessary, after the third of which the ground should be carefully harrowed, and a rake with teeth from nine

to twelve inches asunder be drawn across it, so as to mark lines; and these again must be crossed by others transversely. If the seed be fresh and sound, one will be sufficient; though, if doubts be entertained of its purity, two may be dibbled about the depth of one inch at each point where the lines meet. All weeds ought carefully to be eradicated; and, when the plants come up about a finger's length, they should be divided, and transplanted, in moist weather, to other beds. The chief obstacle to the extensive culture of this plant appears to be, the minute attention required in manuring and dressing the land, by which much labour is incurred. To obviate this, the celebrated French agriculturist, M. de Chateauvieux, made an experiment to raise the beet according to the new husbandry: he therefore sowed it on a bed forty feet long by six feet wide; where the plants were too thick, they were thinned so as to leave a space of fourteen inches between each. On digging up the roots in October, they were all nearly five or six inches in diameter. The harvest generally begins about the end of September: the roots must be dug up with great care, and the leaves and stalks be cut off to prevent them from growing, but so as not to injure the roots.

The MANGEL WURZEL, or ROOT OF SCARCITY, (*B. altissima*, L.,) is a variety of the *B. cicla*, an exotic species of beet, concerning which the highest expectations were formed in Britain some years since, respecting its usefulness as an article of fodder: though these hopes were not fully answered, it certainly will furnish an excellent article of fodder, in particular situations: especially to cows, to whose milk and cream the mangel wurzel imparts a delicate flavour: and we state with pleasure, that increasing attention is now being given to the culture of this most excellent root. On some parts of the continent, this vegetable is preferred for feeding cattle to every other root-crop, its roots and leaves not being subject to the depredations of insects; but it does not fatten so speedily as potatoes, or some other roots *. Its abundant foliage may be given with much advantage to horses, sheep, *cows*, and *swine*; but, for the last two, the leaves should be separated from the roots, as it is asserted that cows and hogs refuse to eat them fresh from the plants. The seed of the mangel wurzel should be dibbled in the month of April

* See following Chapter.

or May, in the same manner as the beet, but in holes from eight to eighteen inches apart.

V. BORECOLE, (a species of cabbage,) is a hardy plant, which promises to be of excellent service to the grazier; as its leaves may be cut without impeding its growth, and it will, in the course of five or six weeks, produce a new crop, while the severest frosts do not affect it. Its culture corresponds with that of the cabbage, which will be hereafter specified, but requires to be raised in clean and well-manured soils, and to be constantly hoed, by which means it will vegetate with uncommon luxuriance. It is particularly calculated for feeding sheep; but these animals ought not to be pastured so long upon the borecole as to injure its stalks, otherwise its future growth will be greatly checked, in consequence of its being deprived of the sprouting leaves.

VI. CABBAGE (*Brassica*, L.)—Of this valuable plant there are several species cultivated in Britain; the sorts most deserving of notice are,—

1. The *turnip-cabbage*, the seed of which should be sown early in March, on a spot of clean land, two perches of which will supply plants enough for one acre: it is eminently calculated to resist the severity of winter frosts, and is much relished by cattle.

2. The *turnip-rooted cabbage* is a very hardy variety of the common cabbage, the seed of which is sown in June, in the same manner as the preceding species; though, if they run too much to stalk, they ought to be speedily transplanted. This sort affords an excellent fodder for oxen, cows, swine, and horses, for the feeding of which it is chiefly cultivated.

3. The *drum-headed cabbage* is also a variety of the common cabbage. Its seed is deposited in beds, either about the end of February or early in March, or sometimes in August; in which case the plants are set out in November, and transplanted in July. This kind is much relished by cows and ewes, and is said to fatten cattle six weeks sooner than any other vegetable; but only the heart should be given to cows, because the leaves (which may without injury be given to other cattle) impart an unpleasant flavour to the milk, cream, and butter of those cows which are fed with them. Should, however, any of the leaves be accidentally given to any cows, the addition of one gallon of boiling water to six times that quantity of milk, when this is ex-

posed in the leads or other shallow vessels, will effectually remove the disagreeable taste.

4. The *green Scotch cabbage* is likewise a very hardy variety, introduced from North Britain, where it is an article of prime importance for cattle-feeding. It possesses this singular advantage, that it will grow on moor-lands; and, if it be cut a short time before the winter frosts set in, it is so well relished by cattle in general, that it is asserted, they will rarely taste any other.

The spring season for transplanting cabbages extends from February—for those sown in the previous autumn, to May; and to August for those sown in the spring. The earlier they are set out the better, as their growth is materially affected by drought. The best distance for a full crop is in squares of three feet, which will allow of the operation of the horse-hoe crosswise, after which the hand-hoe should be unsparingly employed. From four to five months are requisite to bring the plant to maturity. For spring sowing the seed should, if possible, be got into the beds in February, and the plants should be set out towards the middle of April.

All the species and varieties of cabbage are subject to the depredations of numerous insects: in its early growth to the ravages of the turnip-fly, and in a more advanced state to those of the cabbage-fly (*Papilio brassica*, L.) The strewing of the soil with soot will, according to the late eminent botanist Dr. Withering, effectually drive away the turnip-fly; as the whipping of the plants with green elder twigs, or boughs, will secure them from the attacks of the cabbage-fly. To prevent the approaches of caterpillars, it has been suggested to sow the borders of the intended cabbage plantation with hemp; and the mixing of one ounce of flower of sulphur with half a pound of cabbage seed, in a pot closely covered, will, it is said, produce similar effects. Another successful expedient for preserving young cabbages, previous to transplanting them, is to sow the seed in a box, elevated a few feet above the ground: this has been, as yet, practised only by one or two intelligent agriculturists in America. It is a question, whether it is best to transplant cabbages, or to set the seeds in the spot, and at the proper distances where they are to grow: by the last-mentioned method, they are said to escape being stinted in their growth by transplanting, but, upon the whole, we are inclined to prefer the removal of the cabbages from the seed-beds; otherwise, indeed, they are

liable to be too tall, and to have crooked stems. Moist weather is peculiarly favourable for this purpose; and the holes should be filled with suds, (which are, in this case, better than clear water,) unless the soil be naturally very moist; and Dr. Darwin has remarked that, in transplanting cabbages, it is best to *pluck* and not to *dig* them up, as by that means more of the root-fibres are torn off, and the plants become almost totally oviparous.

VII. The CARROT, (*Daucus carrota*, L.,) is raised from seeds, which ought to be previously well rubbed in the hands, to divest them of their beards, and mixed with ashes, as they are liable to adhere together, and will come up in patches. They flourish best in light, sandy loams, which ought to be well loosened by frequent deep ploughing and harrowing, in order to admit of their long tap-roots penetrating to the necessary depth; but, from a successful experiment made in the north of Scotland, there is reason to believe that they will flourish equally well in *peaty soils* *. When broad-cast, they will require to be thinned out to the distance of half a foot asunder, and should also be hoed, in order to give every possible facility to their growth; after they have been thus hoed, a harrow is sometimes passed over them with the same view, and without any injury to one plant, perhaps, in fifty; but it is a slovenly practice, for, after harrowing, it will be necessary to go among them, and uncover such of the roots as may be buried under heaps of mould; and, indeed, the most proper is, as nearly as possible, that of the garden culture. For cattle of every description, carrots supply an excellent and nourishing food; and, as far as respects the amount of their produce, and their freedom from the ravages of vermin, they are greatly superior to turnips; but, as they will not withstand the winter, like cabbages, if left in the ground, the following mode of preserving them has been suggested, and successfully practised, by some agriculturists:—

Soon after Michaelmas, during dry weather, let the roots be dug up, and piled upon an earthen bank, raised about six inches

* Sir John Sinclair on Scottish Husbandry, Vol. I. p. 303. Another important discovery has recently been made in Scotland respecting the culture of carrots, viz. that by raising alternate rows of carrots and onions, the former are protected from the depredations of insects, to which the smell of onions is probably offensive. This practice may easily be carried into effect where carrots are cultivated in gardens, if not to carrots cultivated in fields. Ibid. p. 302.

above the level of the soil, and adapted to the quantity of carrots intended to be stored. On this is then to be spread a thin layer of dry straw, and on this the carrots are to be placed, two or three deep, with successive intervening strata of straw; the tops being turned outwards, and their ends folding one over another, while the smaller roots are *topt* and thrown in the centre. The stacking may be continued to the height of about four feet, when the whole is covered with an additional quantity of straw, and thatched with sedge. Another line is then commenced in the same manner, leaving room for one to pass between; and the interval is next filled up with dry straw, and the outsides defended with bundles of straw staked down, or fastened with hurdles. Thus arranged, carrots will be effectually secured from frost, and afford a regular supply of wholesome fodder at a time when almost every other vegetable is destroyed *.

As carrots will not only grow without the assistance of manure, but as good crops have been thus obtained, an opinion very generally prevails, that the application of manure is injurious: it is so far true that dung very frequently occasions the plant to become *forked*, and thus spoils its appearance for the market; but where the object is to raise a crop for cattle, manure will always be found to increase the product.

VIII. PARSNIPS, (*Pastinaca sativa*, L.,) though refused by cattle in a wild state, afford, when cultivated, an article of food which, from recent trials, appears to be superior to almost any other root for fattening oxen, and especially swine, as well as for improving the quality of milk. The seed should be sown either in autumn, immediately after it is ripe, or in February or March, otherwise the growth of the plants will be impeded by weeds. If broad-cast, parsnips require to be thinned to the distance of ten or twelve inches apart; if dibbled, the seed should be deposited in rows eighteen inches asunder, and ten inches distant one from another in those rows. They should be horse-hoed twice, and after the second hoeing, be earthed up, though not so as to bury the leaves. The parsnip flourishes best in rich, deep loams, though it will do well on sandy soils.

* Annals of Agriculture, Vol. XI. See also an interesting paper on the cultivation of carrots, in Communications to the Board of Agriculture, Vol. VII. Part. I.

In the isle of Jersey, where the parsnip-husbandry is perhaps most successfully prosecuted, these roots and beans are generally sown together after barley. The following is the system usually pursued:—

The soil is either dug with a spade after a first ploughing, or stirred with two ploughs of different shapes following each other, as the soil for this purpose must be stirred from the bottom. In Jersey, a plough is made for this sole purpose, which will go to a depth of fifteen inches. This operation is performed in January or February: the ground thus tilled is then coarsely harrowed, and beans are dibbled by women in rows five feet asunder; after which the parsnip seed is sown broad-cast, and the whole finely harrowed. In May, the ground is carefully weeded both by hand and with a small weeding-fork; and the hand-hoe, to thin the crop like turnips, has been used with advantage. In the beginning of September, the beans are pulled from the parsnips; and, towards the close of the same month, these are begun to be taken up, but are only removed as they are wanted for the cattle, until the ground requires to be cleared for sowing wheat, which is generally by the middle of December. The unconsumed part is then brought dry under sheds, and will keep good without any care till the end of March; but if they are to be kept longer, they are stacked in double rows, one over another, with their heads outwards, with alternate layers of earth. This method is always adopted for such roots as are intended for seed, and for culinary purposes: they are not injured by frost, and possess the very valuable property of vegetating after they have been frozen.

Parsnips are given in a raw state, with great advantage, to hogs and horned cattle; but they render horses languid, and it is said are apt to injure their sight. Cows fed upon them during the winter months, are stated to produce a greater quantity of milk and butter, and of better flavour, than when fed upon potatoes; but they soon become cloyed with the parsnips alone; and the leaves must not be used, as they impart a very disagreeable taste. Parsnips are considered to be dangerous food for sows before they farrow, but hogs may be fattened with them in about six weeks; and they are sometimes given to sheep for the same purpose. It is a general opinion in Jersey, that all cattle may be made fit for slaughter in less time than

would be required with potatoes; and the butchers give more for them in proportion to their weight, as they always contain a greater quantity of tallow *.

IX. The JERUSALEM ARTICHOKE, (*Helianthus tuberosus*, L.,) is a hardy, bulbous-rooted exotic, the culture of which, though at present little regarded, except as a culinary article, deserves to be more generally known. Its stalk often attains the height of nine feet. This plant produces no ripe seeds, but is easy to be propagated by the *roots*; which, when once planted, continue to vegetate in the same soil without the aid of manure, or being in any degree affected by the rigour of our winters. The roots are particularly useful for feeding *swine*, and uncommonly productive. One spirited cultivator found its produce to be about 480 Winchester bushels per acre, without manure. Another (Mr. Peters) has stated, that he obtained between seventy and eighty tons from one acre; and he is of opinion, that seven acres will keep 100 swine for six months, allowing each head fifty-six pounds per day, at an increase from 10*s.* to 15*s.* in value, especially if the root be boiled in sweet hog-wash †. As the Jerusalem artichoke will flourish on almost any soil, and its culture is by no means difficult, being the same with that of potatoes, it might be very profitably raised in many barren and unoccupied wastes: no other precaution for preserving its roots during winter is necessary, except the digging of a ditch round the plants, to prevent the water from injuring them. For this useful fact, we are indebted to Mr. Legaux, an intelligent agriculturist of Spring-Mill, Pennsylvania, who had artichokes eight and nine inches in diameter. It must, however, be admitted, that they seem to possess but little nutriment, being watery and unsubstantial; but they deserve a trial, from the ease of their cultivation, and may, perhaps, prove useful as an occasional substitute for better food.

X. FURZE, (*Ulex Europæus*, L.,) though by many regarded as a noxious weed, may be advantageously cultivated in light sandy soils, by sowing its seed in February, March, or April, or at all events early in May, in the proportion of six pounds per acre. In the month of October, or perhaps a little earlier in the fol-

* M. Le Hardy, on the Culture of Parsnips, in the Agricultural Magazine, No. 33.

† Winter Riches, p. 48.

lowing year, it may be mown, when it will continue till Christmas, and be fit for use till March. Furze requires to be bruised in a mill before it can be eaten by cattle, but it is very invigorating; and if given to horses, after being recently bruised, they will, it is said, prefer this shrub to hay, or even to corn. It will continue growing for several years, producing from ten to fifteen tons per acre, which are in some districts regularly stacked for winter use, as a substitute for hay. It is of use when better provender is short, or in severe winters, when field stock are driven from the pastures; but although cattle will exist upon it, they cannot thrive without the addition of other food.

In addition to furze, it is probable that *horse-chestnuts* would form a valuable (though hitherto neglected) article of food for horses. In Turkey, the practice is to grind the nuts, and mix them with other food, which is given to horses; particularly to such as are troubled with *coughs;* and they are there considered as a remedy for broken wind.

CHAPTER VI.

ON THE QUALITIES AND COMPARATIVE VALUE OF SOME GRASSES AND ROOTS, AS FOOD FOR CATTLE.

MANY experiments have been made to discover the relative value of different kinds of food for cattle, by feeding the various species of stock with a given quantity of each, and weighing the animals in order to ascertain the increase of flesh gained by each during a certain period. But the result of all such experiments depends so much on the breed, age, and constitution of the animals, as well as upon hidden causes in the digestive process, that they have been generally found inconclusive; and thus have arisen the numberless contradictory statements that have been published.

With a view to rectify those errors, and to establish a system, on the correctness of which reliance might be placed, a series of experiments was undertaken, at Woburn, by the Duke of Bed-

ford, and conducted under the able superintendence of his very intelligent gardener, Mr. George Sinclair, who has communicated the results to the public in a volume entitled, *Hortus Gramineus Woburnensis*, which cannot be too strongly recommended to the attention of every farmer.

The various grasses were cultivated separately, in equal proportions, and thus the quantity of fodder produced by each upon an acre was ascertained; an equal portion of this produce was then subjected to a scientific process, by means of which the qualities of each were accurately established; and by submitting the dung of cattle fed upon these grasses to chemical tests, a correct knowledge was obtained of the different particles retained in the stomach for the purposes of nutriment: whereby, collectively, the quantity, the quality, and the nutritive power of each being known, their relative value is easily determined. The importance of such experiments requires no illustration; and, by permission of the Author, we shall give a brief summary of a few among them, referring to the work itself for more interesting details.

It was found that vegetable matter is chiefly composed of gluten, mucilage, saccharine matter, or sugar, and bitter extract. It is upon the several proportions of these, exclusive of the woody fibre which forms their basis, that their nutritive value depends; but, as a due proportion of each is necessary to digestion, and consequently to health, plants may be separately unwholesome, which collectively would be found highly nutritious. Thus, in an experiment recorded by Mr. Sinclair*:—"Two fields were sown down for pasture; one with white clover and trefoil only, and the other with a variety of the natural grasses, among which there was a portion of white clover. The two fields were depastured with sheep. In the inclosure of the white clover a considerable quantity of cock's-foot grass grew on the edge of the fence; it was of a very harsh quality from its unfavourable situation, and consisted almost entirely of culms. In a few days the sheep went to this grass, and ate it down entirely, though there was a profusion of white clover. In the course of time many of these sheep became infected with the disease termed *red-water*, of which some died; but, in the adjoining field, which contained the natural grasses,—cock's-foot,

* Sect. I. p. 8.

rough-stalked meadow grass, rye grass, fox-tail grass, and white clover,—the sheep were not affected with that, nor any other disease; and they left untouched the stems of the cock's-foot, which were here of a more tender and succulent nature than those on the edges of the other field, which were so greedily devoured by the clover sheep."

Now it may be observed, that if the hard stocks of the cock's-foot in the clover field had been in sufficient quantity, they would, most probably, have prevented the disease from attacking the sheep; but this could not have been by virtue of the dry fibre only of the culms, because, in the adjoining field, where every thing was contrary to disease, the sheep rejected the culms altogether. The dry, or mechanical action of the culms was here wanting, yet the animals continued healthy, and fattened, because the bitter extract was in greater proportion to the leaves or herbage than in the culms which they rejected; and also proved beneficial when combined with succulent food, which could not partake of the action of the dry hay before mentioned.

Hence the importance will be perceived of minutely ascertaining the various properties of cattle-food, and their effects upon the different animals to be fed; and it has been justly observed by Mr. Sinclair, "That without the means of distinguishing with certainty the different species of grasses, the cultivator must have recourse to other men's experience and assistance, before he can make any certain or just experiment of his own, or any consequent improvement. The farmer who cannot distinguish the seed of the most valuable species of grasses from those that are worthless, or pernicious, must be subject to serious losses and disappointments occasioned by every accident in the course of his practice, which may place in his hands the seeds of inferior or pernicious plants, instead of those grasses adapted to his soil, and possessing the most productive and nourishing properties; and should he be unable to distinguish the plants produced from those grass seeds which he may sow under such circumstances, he must wait until the non-advancement in condition of his stock informs him of his loss." For much of this valuable information, we must again refer to Mr. S. himself, and shall only add some of the results of the few experiments to which we have already alluded.

	Nutritive Matter.	Fibre.	
CABBAGES.—7000 grains or 1 lb. of the cattle, or drum-headed cabbage, consists of	430 grs.	280	The remainder water.
Early York	430	812	
Purple borecole	448	1120	
Woburn perennial kale	438	932	
Green-culled kale	440	880	
Turnip-rooted cabbage	252	360	

TURNIPS.—64 drachms of the Swedish turnip afforded, of nutritive matter	110	grains.
Stone, or garden do.	85	do.
Norfolk white	85	do.
Common, or white loaf	80	do.
Tankard, or long-rooted	76	do.

Kohl rabi produced about the same quantity of nutritive matter as Swedish turnips; and

Swedish turnips were superior to cabbages in the quantity of nutritive matter in the proportion of 110 to 107½.

Common turnips were inferior to cabbages in the quantity of nutritive matter in the proportion of 80 to 107½.

But the quantity of nutritive matter contained in turnips varies according to the size and texture of their substance. A root of the white-loaf variety, measuring 7 inches in diameter, afforded only 72½ grains; while the same quantity of a root measuring only 4 inches afforded 80. The middle-sized roots of the common turnip are therefore the most nutritious; but, on the contrary, the largest of the Swedish turnips produced 110 grains, while the small only produced 99.

POTATOES.—64 drachms of the champion contained, of nutritive matter	260	grains.
Hundred-eyed	218	do.
Rough-red	204	do.
Purple-red	200	do.
Oxnoble	195	do.
7000 grains of the black kidney potatoe contained, of soluble mucilage	970	do.
Pure starch	700	do.
Fibre	620	do.
Water	4710	do.

Which shews that the quantity of water contained in raw potatoes is much greater than usually supposed, and proves the propriety of steaming them when given to cattle.

CARROTS.—Of four varieties, the long-red was found the most productive:—64 drachms afforded 187 grains of nutritive matter.

Mangel wurzel was found superior to common turnips and carrots, but inferior to cabbages and potatoes.

64 drachms of Burnet produced, of nutritive matter	100	grains.
Lucerne	90	do.
Broad clover	80	do.
Chicory	60	do.

	Nut. Matter.	Fibre.	Water.
3000 grains of Common tares produced..	193 grs.	577 grs.	2250 grs.
White clover	100	470	2430

The acreable produce of lucerne was found to exceed that of broad clover, in the proportion of about 7 to 5 of green herbage; and when made into hay, of 9 to 4.

BOOK THE TENTH.

ON MANURES IN GENERAL, AND THEIR APPLICATION TO GRASS-LAND.

CHAPTER I.

ON VEGETABLE MANURES.

THE manuring of land is an operation by which those substances are communicated to the soil from which vegetables can draw an additional degree of nourishment. Under the term *manure* is included every substance that is calculated to afford such nourishment, and to ameliorate the soil, either by remedying or improving its natural poverty, or by correcting its too great looseness, stiffness, or other qualities which retard vegetation.

Manures may be divided into five classes, *vegetable*, *animal*, *fossil*, *fluid*, and *compound*, each of which forms a distinct subject of consideration, to which we shall annex some remarks on the best modes of collecting and preserving manures, and their application to the land.

Vegetable manures, which claim our first attention, are either entire plants which are sometimes turned in by the plough while they are growing, or vegetables in a state of decomposition either through putrefaction, or from having been burned.

Vegetable ashes are, in general, most effectual for manuring cold, marshy, boggy, moist, and uncultivated soils: thus, on all cold, clayey, or tenacious loamy soils, wood-ashes may be used with very good effect, in the quantity of about forty bushels * per acre. But of the various kinds of ashes in use, those

* The strike bushel is invariably to be understood, unless a contrary standard be specified.

of peat are, perhaps, best calculated for grass land. The most valuable are obtained from the slow combustion (similar to that of making charcoal) of the lowest stratum of peat, where the fibres and vegetable roots, of which peat consists, are most decayed. After the peat is collected into a large heap, and covered to prevent its flaming, it must be suffered to consume slowly, till the whole is completely incinerated or reduced to ashes. Thus, burnt peat ashes, as well as those of fern, stubble, &c. may be applied with great advantage on sour meadows, where they destroy rushes and other aquatic weeds, and produce, instead of these, abundant crops of good grass.

This operation has been carried into execution upon a large scale, in the county of Mid-Lothian, by Lord Meadowbank, one of the lords of session in North Britain; from whose very interesting tract * on the conversion of peat-moss into a valuable manure, we have selected the following important particulars. Several agriculturists have practised his Lordship's method of forming composts with the happiest success.

"All recently dead animal or vegetable matter, if sufficiently divided, moist, and not chilled nearly to freezing, tends spontaneously to undergo changes, that bring it at length to be a fat, greasy earth, which, when mixed with sands, clays, and a little chalk or pounded limestone, forms what is called rich loam, or garden-mould.

"In vegetable matter, when amassed in quantities, these changes are at first attended with very considerable heat, (sometimes proceeding the length of inflammation,) which, when not exceeding blood-heat, greatly favours and quickens the changes, both in animal matter, and the further changes in vegetable matter, that are not sensibly attended with the production of heat. The changes attended with heat, are said to happen by a fermentation, named from what is observed in making of ale, wine, or vinegar. The latter are ascribed to what is called *putrefactive fermentation.*

"Besides moderate moisture and heat, and that division of parts which admits the air in a certain degree, circumstances which seem to be necessary to the production of these changes,

* The tract here referred to having been privately printed, and not intended for public sale, we have taken the more largely from it, as but few persons can have the advantage of consulting the original.

stirring, or mechanical mixture, favours them; and a similar effect arises from the addition of chalk, pounded lime-stone, lime, rubbish of old buildings, or burnt lime brought back to its natural state; and also of ashes of burnt coal, peat, or wood, soap-leys, soot, sea-shells, and sea-ware. And on the other hand, the changes are stopped or retarded by the pressure or consolidation excluding air; by much water, especially when below the heat of a pool in summer; by astringents; and by caustic substances, as quick-lime, acids, and pure alkalies, at least their causticity is mollified, at the expense of the destruction of part of the animal and vegetable matter to which they are added.

"These changes are accomplished by the separation or decomposition of the parts or ingredients of which the dead vegetables and animals are composed; by the escape of somewhat of their substance in the form of vapours or gasses; by the imbibing also somewhat from water and from the atmosphere; and by the formation of compound matters from the reunion of parts or ingredients, which had been separated by the powers of the living vegetables and animals. The earlier changes, and in general those which take place previous to the destruction of the adhesion and texture of the dead vegetables and animals, appear to be rather pernicious than favourable to the growth of living vegetables, exposed to the direct effect of them; whereas the changes subsequent to the destruction of the animal and vegetable texture promote powerfully the growth of plants, and, partly by their immediate efficacy on the plants exposed to their influence, partly by the alterations they produce in the soil, constitute what is to be considered as enriching manure.

"It should be the object of the farmer to give his soil the full benefit of these latter changes, decompositions, and recompositions which proceed slowly, and continue to go on for years after the manure is lodged in the soil. Even loam or garden-mould is still undergoing some remaining changes of the same sort; and, by frequently stirring it, or removing it, and using it as a top-dressing, its spontaneous changes are so favoured, that it will yield heavy crops for a time, without fresh manure; or, in other words, it is rendered in so far a manure itself, as it decomposes faster than in its ordinary and more stationary state, and, in so doing, nourishes vegetables more abundantly,

or forms new combinations in the adjoining soil, that enable it to do so.

"It should also be the object of the farmer to employ the more early changes, not only to bring forward the substances undergoing them into a proper state to be committed to the soil, but to accelerate or retard them, so as to have his manure ready for use at the proper seasons, with as little loss as possible, from part being too much and part too little decomposed; and also to avail himself of the activity of those changes, to restore to a state of sufficiently rapid, spontaneous decomposition, such substances in his farm, as, though in a state of decay, had become so stationary as to be unfit for manure, without the aid of heat and mixture.

"By attention to the first two particulars, and the proper use of compression, stirring, and mixture, the farm dunghill, though formed slowly, and of materials in very various states of decay, is brought forward in nearly the same condition. By attention to the latter, manure may, in most situations, be tripled or quadrupled. On the other hand, by inattention to them, part of the manure is put into the soil unprepared, that is, in a situation where the texture of the vegetable is still entire; and, its decomposition never having been carried far by the heat and mixture of a fermenting mass, proceeds in the soil so slowly, that, like ploughed-down stubble, it does not merit the name of manure. Part, again, is apt to be too much rotted, that is, much of it is too nearly approaching to the state of garden-mould, whereby much benefit is lost, by the escape of what had been separated during the process it has undergone, and the good effects on the soil of what remains are less durable; for, between solution in water, and rapid decomposition from its advanced state of rottenness, it is soon reduced to that of garden-mould; and, in fine, the powers of fermenting vegetable with animal manure, which, when properly employed, are certainly most efficacious in converting into manure many substances that are otherwise very stationary and slow in their decomposition, are lost to the farmer, so that he is often reduced to adopt an imperfect and little profitable mode of cultivation, from the want of the manure requisite for a better, though such manure may be lying in abundance within his reach, but useless from his ignorance how to prepare it.

"Peat-moss is to be found in considerable quantities within

reach of most farms in Scotland *, particularly in those districts where outfield land (i. e. land not brought into a regular course of cropping and manuring) forms the larger part of the arable land. It consists of the remains of shrubs, trees, heath, and other vegetables, which, under the influence of a cold and moist climate, and in wet situations, have got into a condition almost stationary, but much removed from that of the recently-dead vegetable, and certainly considerably distant from that of garden-mould. It is no longer susceptible of going of itself, though placed in the most favourable circumstances, into that rapid fermentation, accompanied with heat, which masses of fresh vegetables experience; but it is still a powerful fuel when dried; and, on the other hand, it requires long exposure to the seasons, in a dry situation, before, without mixture, it is fit for the nourishing of living vegetables.

"In general, however, there is nothing in the situation of peat-moss, or in the changes it has undergone, that leads to think that it has suffered any thing that unfits it to be prepared for manure. It is no doubt found sometimes mixed with particular mineral substances, that may be, for a time pernicious to vegetation; but, in general, there is no such admixture, and, when it does take place, a little patience and attention will be sufficient to cure the evil. In the ordinary case, the only substances found in peat that may be unfavourable to vegetation, in so far at least as tending to keep it stationary and prevent its rotting, are two, and both abounding in fresh vegetables of the sorts of which moss is chiefly composed: these are, gallic acid, and the astringent principle, or tan; and as these are got the better of in fresh vegetables, by the hot fermentation to which they are subject, so as to leave the general mass of the substances to which they belonged properly prepared manure, there is no reason to suppose, that the same may not be accomplished with the acid and tan of peat. Again, the powers of peat, as a fuel, and of peat-ashes as a manure, ought to convince every person, that the material and more essential parts of the dead vegetable, for the formation of manure, remain entire in peat. Here the inflammable oils and carbonaceous matter

* And also in England, particularly near Newbury, in Berkshire; and near Gatton and Frimley, Surrey; beside many other places that might be specified. The Newbury ashes are particularly celebrated for their fertilizing qualities.

which abound in the fresh vegetable, and the latter of which also abounds in garden-mould, remain entire; the soot and ashes, too, which are the results of the inflammation of each, seem to be nearly equally fertilizing; and, in short, little seems to be lost in peat but the effects of the first fermentation in preparing the matter to undergo its future changes with the rapidity requisite to constitute manure. Besides, the soil produced from peat-earth, by exposure for a course of years, seems not to be sensibly different from that obtained from dung in the same way. Both are deficient in firmness of texture; but are very prolific when mixed with clays, sand, and calcareous earths, in due proportion.

"From considering the preceding circumstances, and from trying what substances operated on tan, and on the acid found in peat-moss, it was determined to subject it to the influence of different sorts of fermenting dung, with due attention to the proportions used, and to the effects of the different preparations; and the following is the direction which an experience of six crops recommends to practice.

"Let the peat-moss, of which compost is to be formed, be thrown out of the pit for some weeks or months, in order to lose its redundant moisture. By this means, it is rendered the lighter to carry, and less compact and weighty, when made up with fresh dung, for fermentation, and accordingly less dung is required for the purpose, than if the preparation is made with peat taken recently from the pit.

"Take the peat-moss to a dry spot, convenient for constructing a dung-hill, to serve the field to be manured. Lay it in two rows, and dung in a row betwixt them; the dung thus lies on the area of the compost-dunghill, and the rows of peat should be near enough each other, that workmen, in making up the compost, may be able to throw them together by the spade, without wheeling. In making up, let the workmen begin at one end. Lay a bottom of peat, six inches deep, and fifteen wide, if the ground admit of it. Then lay about ten inches of dung above the peat; then about six inches of peat; then four or five of dung, and then six more of peat; then another thin layer of dung; and then cover it over with peats at the end where it was begun, at the two sides, and above. It should not be raised above four feet, or four and a half feet high, otherwise it is apt to press too heavily on the under part, and

check the fermentation. When a beginning is thus made, the workmen will proceed working backwards, and adding to the column of compost, as they are furnished with the three rows of materials, directed to be laid down for them. They must take care not to tread on the compost, to render it too compact; and of consequence, in proportion as the peat is wet, it should be made up in lumps, and not much broken.

"In mild weather, seven cart-loads of common farm-dung, tolerably fresh made, are sufficient for twenty-one cart-loads of peat-moss; but in cold weather, a larger proportion of dung is desirable *. To every twenty-eight carts of the compost, when made up, it is of use to throw on above it a cart-load of ashes, either made from coal, peat, or wood; or if these cannot be had, half the quantity of slack lime may be used, the more finely powdered the better. But these additions are no ways essential to the general success of the compost.

"The dung to be used should either have been recently made, or kept fresh by compression, as by the treading of cattle or swine, or by carts passing over it. And if there is little or no litter in it, a smaller quantity will serve, provided any spongy vegetable matter is added at making up the compost, as fresh weeds, the rubbish of a stack-yard, potato-shaws, sawings of timber, &c. And as some sorts of dung, even when fresh, are much more advanced in decomposition than others, it is material to attend to this; for a much less proportion of such dung as is less advanced, will serve for the compost, provided care is taken to keep the mass sufficiently open, either by a mixture of the above-mentioned substances, or if these are wanting, by adding the moss piece-meal, that is, first mixing it up in the usual proportion of three to one of dung, and then, after a time, adding an equal quantity, more or less, of moss. The dung of this character, of greatest quantity, is shamble-dung, with which, under the above precautions, six times the quantity of moss, or more, may be prepared. The same holds as to pigeon-dung, and other fowl dung; and to a certain extent

* Mr. Thompson of Bewlie, in the county of Roxburgh, follows Lord Meadowbank's directions as nearly as possible, in the making of compost dung-hills; but when he has abundance of dung, he puts only two or two and a half cart-loads of moss, instead of three to one cart-load of dung, and finds it as efficacious as dung alone. Sir J. Sinclair on Scottish Husbandry, Vol. I. p. 210.

also as to that which is collected from towns, and made by animals that feed on grains, refuse of distilleries, &c.

"The compost, after it is made up, gets into a general heat, sooner or later, according to the weather and the condition of the dung: in summer, in ten days, or sooner; in winter, not perhaps for many weeks, if the cold is severe. It always, however, has been found to come on at last; and in summer, it sometimes rises so high, as to be mischievous, by consuming the materials (fire-faning). In that season a stick should be kept in it in different parts, to pull out and feel now and then: for if it approaches to blood-heat, it should either be watered, or turned over; and on such an occasion, advantage may be taken to mix it with a little fresh moss. The heat subsides after a time, and with great variety, according to the weather, the dung, and the perfection of the making up of the compost; which then should be allowed to remain untouched, till within three weeks of using, when it should be turned over, upside down, and outside in, and all lumps broken: then it comes into a second heat; but soon cools, and should be taken out for use. In this state, the whole, except bits of the old decayed wood, appears a black, free mass, and spreads like garden-mould. Use it, weight for weight, as farm-yard dung; and it will be found, in the course of cropping, fully to stand the comparison.

"The addition recommended of ashes or lime, is thought to favour the general perfection of the preparation, and to hasten the second heat. The lime laid on above the dung-hill, as directed, is rendered mild by the vapours that escape during the first heat.

"Compost, made up before January, has hitherto been in good order for the spring crops; but this may not happen in a long frost. In summer, it is ready in eight or ten weeks; and if there is an anxiety to have it soon prepared, the addition of ashes, or of a little lime-rubbish of old buildings, or of lime, slaked with foul water, applied to the dung used in making up, will quicken the process considerably.

"Lime has been mixed previously with the peat; but the compost prepared with that mixture, or with the simple peat, seemed to produce equally good crops. All the land, however, that it has been tried on, has been limed more or less, within these twenty-five years.

"Peat prepared with lime alone has not been found to answer

as a good manure. In one instance, viz. on a bit of fallow sown with wheat, it was manifestly pernicious."

Another very simple process, by which peat-moss earth may be rendered valuable as a manure, has been discovered by Dr. Rennie, of Kilsyth. He proposes, "that it shall be laid alongside of a pool formed for receiving the juice of the dung-hill. For ten days it ought to be saturated with that liquid, occasionally turning it during the process of watering: it should then be allowed to lie in a thick heap, and to acquire a very gentle, almost an imperceptible degree of fermentation, after which it is fit for application.*" By the abstraction of its juices, however, Sir John Sinclair remarks, the dung-hill would be greatly deteriorated. But, as in almost all yards belonging to extensive farms, there is a surplus of dung-hill liquor which oozes from the dung-heaps, we conceive that *this* fluid might be very beneficially applied in the manner Dr. Rennie proposes, where peat-moss can be commanded.

The quantity per acre of peat ashes is stated by Mr. Malcolm† to be as follows: On strong retentive lands for *pasture*, twelve bushels top-dressed: On *lighter loams*, ten bushels, and on *sandy* or *chalky loams*, for pasture or seeds, eight bushels; to be laid on in autumn.

The following very interesting account of the application of DUTCH ASHES, to improve the crops of clover, and the succeeding crops of wheat; and on the importance, in other respects, of this species of manure, is given by Sir John Sinclair‡:—

"For a number of years past, the crops of clover in England have gradually become more and more deficient, and the crops of wheat sown after the clover, have frequently failed. It was supposed, that from too frequent repetition, the ground had become tired of clover, and that the same success in cultivating it could not be expected. The failure of the crop of wheat afterwards was peculiarly unfortunate, and certainly greatly contributed to the scarcities which have of late prevailed in this country. I was much gratified therefore to find, that in Flanders there were no complaints of the failure of the crop of clover, (except in one district, where a plant, called the orobanche, infested the ground,) and that the crop of wheat, after clover,

* Sir J. Sinclair on Scottish Husbandry, Vol. I. p. 210.

† Compendium of Modern Husbandry, Vol. II.

‡ Hints regarding the Agricultural State of the Netherlands, 1815.

was reckoned among the surest of any. It was still more satisfactory to ascertain, that the means of obtaining similar results, were distinctly known, were not expensive, and could easily be procured in England, being nothing but the application of Dutch Ashes.

"According to the best information I have hitherto been able to obtain, there are two sorts of turf or peat in Holland. The first is found on rising grounds, and in a sandy soil, at from three to twelve feet from the surface, the strata varying from eighteen inches to three or four feet in depth. This sort is principally found in Friesland. It is cut and prepared in the same manner as the peat of Scotland and Ireland, burns quickly and cheerfully, gives a good heat, but leaves only a very light ash, of little value. The other sort of peat, which is more generally used in Holland, is extracted from the marshes, which are constantly covered, during the winter season, with water of a *brackish* nature; after this peat is reduced to a pulp, it is spread upon the ground, and when it has acquired a certain consistency, it is cut and dried in the same manner as the former. It burns less clear, and gives less heat than the other peat, but it lasts longer, and leaves a much heavier ash, full of saline matter, insomuch that it is sometimes used as a substitute for soda, in the manufacture of green glass. This can only be accounted for by the effects of the water by which it is covered, which not only deposits a muddy substance, whence the richer part of the ashes is derived, but the water being of a brackish quality, it impregnates the peat with salts.

"These ashes were analysed about fifty years ago, when it appeared that from one-ninth to one-twelfth part consisted of glauber and marine salts *. In a recent analysis by Professor Brande, of the Royal Institution, the contents of the specimen given him were as follow:—

* See Mémoires de l'Academie de Bruxelles, Tome III. p. 47, where there is a paper written by the Abbé Marci, read on the 13th December, 1775, on the subject of artificial manures, and stating the advantage of using these Dutch ashes, as being then well known.

" Silicious earth	82
Sulphate of lime	12
Sulphate and muriate of soda	6
Carbonate of lime	40
Oxide of iron	3
	93
Impurities and loss	7
	100

" In such an article, however, the variety of substances to be found in it must be very great, and in different proportions.

" In every part of the interior of Flanders these Dutch ashes are used for clover, and with a success hardly to be credited. They are brought to Brussels by a canal, and thence are conveyed, by *land carriage*, to the distance of from 50 to even 100 miles. Wherever they are used, there is no complaint of any deficiency either in the crop of clover, or of the wheat afterwards. Some instances of their success, it may be proper to specify.

" Mr. Mosselman, a great farmer at Chenoi, near Wavre, assured me, that without the ashes of Holland, he could neither have a crop of clover, nor of wheat afterwards; and that wheat, after clover, *manured with Dutch ashes*, was the most certain crop of any.

" Mr. Hanelot, near Fleurus, declares, that he sows upon clover twenty-five cuvelles of Dutch ashes per hectare; (about nineteen bushels per English acre;) that no manure, though it were to be given in greater quantities, and at more expense, would equal it in strength; that after sowing these Dutch ashes, they always have two great crops of clover, besides pasturage afterwards; and that the next crop of wheat is not more injured by insects, than the other crops of that grain.

" Observing a great heap of dung in a field near Baulet, I inquired of Mr. Grossjean, the farmer who accompanied me, what it was intended for. He answered, that it belonged to another farmer, who thought to render the use of Dutch ashes unnecessary, by spreading a great quantity of dung on his young clover during the winter, and collecting it in the spring to carry to another field; but there was no comparison between the clover where the Dutch ashes had been applied, and the field

that had been covered with the dung, the former being much forwarder, and in every respect superior.

"Mr. Vandoorslair, in the Pays de Waes, informs me, that this manure is used with great benefit where clover is kept for a second year, whether for cutting or pasture, and its advantage, where that practice is adopted, would be incalculable, as the second year's crop is of little value at present.

"It is unnecessary, however, to dwell more on individual opinions, when eighty-three practical farmers in the neighbourhood of Fleurus, have joined in a public declaration to the following effect:—"All our farmers know by experience, that when clover is not manured at the rate of twenty-five cuvelles of Dutch ashes par bonnier, the following crop (of wheat) is very bad, notwithstanding any culture that can be given to the soil, whereas they always have an excellent crop of wheat after clover, and, doubtless, in proportion to the quantity of manure above mentioned being used." The farmers who have subscribed this declaration, must have been deeply impressed with the importance of these ashes; for, in general, they must have brought them from forty to fifty miles, by land carriage, from wharfs on the canal of Brussels.

"These circumstances astonished me more than any thing I had met with in the whole course of my excursion. The advantages of Dutch ashes have been long known on the Continent; and though it would be as easy to import them into England or Scotland, as into Flanders, it does not appear to have been ever thought of, or tried; and on my return to England, on the 22nd of April last, the crops of clover in Kent seemed to me from a fortnight to three weeks behind, in regard to maturity, and greatly inferior in point of produce, to those I had seen on the Continent; which, I am persuaded, was entirely owing to the use of these ashes.

"Upon enquiring into the price of these ashes at Brussels, I found it was one franc fifty centimes par hectolitre, (about 5*d.* sterling per bushel); that it required 16 hectolitres (about 47 bushels) par hectare, containing rather less than three English acres. The quantity therefore is about eighteen or nineteen bushels per English acre, or from 7*s.* to 8*s.* besides the carriage.

"Mr. Ferrier, the British Consul at Rotterdam, (whose ready attention to my enquiries I acknowledge with much pleasure,)

informs me, that the price at Rotterdam was seven stivers per 100 pounds, Dutch weight; and including all expenses, that it would come to about twelve stivers, which, at the present rate of exchange, is about 1*s.* 4*d.* per 100 pounds weight, delivered free on board. The freight per ton of 2240 pounds, would be about 2*l.* to London, and perhaps about 2*l.* 10*s.* to Leith. The expense, on the whole, would not probably exceed from 10*s.* to 15*s.* per acre, freight included *.

"Dutch ashes are used for various purposes, besides as a manure for clover. Some farmers spread them on the ground where they have sown turnips or carrots, passing a harrow over the surface, and thus destroying the insects which injure those plants. These ashes are likewise sown on rye in October, on wheat and pasture lands as well as on clover in April, and on oats and beans in May. They are of great use to peas; but they render the grain harder, and more difficult to boil. In gardens they are used with much advantage, scattered over the surface, after the land is sown and raked. They are also good for hops, a handful being given to each heap. When applied to grain they promote its early growth, but are principally useful by increasing the quantity. They are in general sown by the hand, like grain; but care must be taken to leave no part of the surface without its just proportion. A still hazy morning is preferred for this operation, lest the wind should blow them away, and prevent their fixing on the soil and plants in the manner intended. The change which these ashes cause on the clover, is perceptible in the course of a week, and it is known, *from repeated experiments*, that without this precaution, vegetation has suffered so sensibly, that in some cases a crop of clover has been lost, and in others, has become less abundant. Among the other advantages of these ashes, it is said, that they not only bring with them the principles of fertility, but that they are also well calculated to hinder the multiplication of all sorts of worms and insects, (hence they may prevent the ravages of the turnip-fly or beetle,) to destroy the mosses and lichens, which injure our pasture lands, and to protect the wheat from several maladies to which it is exposed, in particular the nielle or mildew; and perhaps the exemption of Flanders in so great a degree from

* The expense would now be less than when the above was written.

these maladies, is partly owing to the abundant use of those ashes *.

"When completely analysed, perhaps we may be enabled to procure an artificial compound manure, equally efficacious; or it may be found that clay ashes, now so successfully employed by Mr. Craig of Cally, Mr. Boyd of Merton-hall, and other spirited agriculturists in Wigtonshire, may, in some respects, answer the same purposes.

"Mr. Young informs me, that whilst the crops of clover were abundant, the succeeding crops of wheat were equally good. If, therefore, by the use of these ashes, our former crops of clover can be restored, a double advantage will be obtained. The saline substances in the ashes may also contribute to destroy the wire-worm, and in that way may protect the crops of wheat from injury.

"In a celebrated experiment made in France, wheat sown after a moderate crop of clover was indifferent; after fallow was good, but after a great crop of clover that had been gypsumed, it was, in the language of the report, *superb*. The reasons are obvious. No insect can exist under so suffocating a crop as an abundant one of clover; and the roots of the clover, when abundant, furnish a great quantity of manure for the wheat. It ought to be a rule in farming, to sow oats after a moderate crop of clover, but wheat after a large one.

"I do not know any means by which so great an improvement can be so rapidly, and so generally introduced, and at so moderate an expense, as by the importation of Dutch ashes; and it gives me particular pleasure, that it is likely to promote, in a peculiar degree, the interests of the spirited and intelligent farmers of the county of Norfolk, to whom this species of manure is fortunately so accessible.

"In Switzerland, and other countries where these ashes cannot be had, they make use of gypsum, or the sulphate of lime; but from the best information I have been able to obtain, there is no comparison between the two articles, the Dutch ashes be-

* It appears by the analysis of the turf, (whence the Dutch ashes are derived,) by the Abbé Marci, that the salts are found in the bituminous parts of the peat; and fortunately great quantities of peat, full of bitumen, are to be found in the Hebrides.

ing greatly superior, and much more certain, the effects of gypsum being precarious."

1. *Straw*, when reduced to ashes, has been spread with great benefit as a top dressing on young clover, and on turnips, and, mixed with lime, on grass-land; but as straw may be more advantageously employed in soiling cattle during the winter, this practice is not to be recommended.

2. *Dry straw*, of wheat, oats, barley, beans, and peas, and spoiled hay, or any similar kind of dry vegetable, is (Sir H. Davy remarks) in all cases an useful manure, though he doubts the propriety of indiscriminately adopting the usual practice of making such substances to ferment before they are employed. It is certain, that plants derive nourishment from the straw of different crops, when immediately ploughed into the ground; but there is an objection to this method of using straw, from the difficulty of burying long straw, and from its rendering the husbandry foul.

Much difference of opinion prevails regarding the respective value of *dry* or *fermented straw*, as manure. Sir H. Davy, whose judgment, theoretically, is entitled to the greatest deference, remarks that "When straw is made to ferment, it becomes a more manageable manure; but there is likewise, on the whole, a great loss of nutritive matter. More manure is, perhaps, supplied for a *single* crop; but the land is less improved than it would be, supposing the whole of the vegetable matter could be finely divided and mixed with the soil." * As this, however, can only apply to arable land, the grass farmer must still be content to apply it in a fermented, or rotten state.

3. *Weeds*, in general, are likewise of great service, if they be cut down in their most succulent condition, shortly before they flower; as they are then not only most disposed to putrescence, but also the injury that would otherwise result from the germination of their seeds will thus be effectually avoided. Hence weeds ought not, as is too frequently the practice, to be heedlessly burnt or thrown into the highway; but, if they be spread on the ground in their juicy state, in heaps, and occasionally turned over and covered with soil, they will certainly perish and speedily become putrid. The application of quicklime to weeds will also greatly promote their decomposition:

* Sir H. Davy's Lectures on Agricultural Chemistry, p. 284.

for this purpose it has been recommended to form a stratum or layer of green vegetable matter, about one foot thick; and on this is to be scattered a thin layer of powdered lime, continuing such strata till the pile is of sufficient height. In the course of a few hours, a decomposition of parts will take place, when the heaps should be covered with a few earthen sods, or a little addition of vegetable matter, to prevent the mass from taking fire; at the end of twenty-four hours the dissolution of the vegetable matter will be complete, and a quantity of excellent ashes will be obtained, ready to be immediately spread on the land. Dry *vegetable* recrements may be treated in a similar manner, by previously keeping them in a state of moisture, in order to accelerate their decay; but without suffering water to become stagnant upon them, or allowing cattle to trample too much upon them in the yard.

4. *Sea-weed* is another vegetable manure that may be used with the greatest profit, where the situation of a farmer gives him access to this material. The best mode of applying sea-weeds is to cut them, while in their most succulent state, from the rocks on the sea-coast, and *immediately plough them in:* because much of their enriching matter will be dissipated by exposure to the air. Where, however, they cannot be procured in their juicy state, it will be advisable to collect the weeds when thrown on the shore, and also plough them in immediately; or if they be not wanted for speedy use, they may be formed into heaps, with thin strata of lime, and treated in the manner already suggested with regard to weeds in general. This manure, however, is transient in its effects, seldom if ever lasting more than a single crop; which is easily accounted for from the large quantity of water, or of the elements of water, which it contains *. Sir J. Sinclair states, that it should never be applied on ground for turnips after March, as it rarely incorporates with the soil in such a way as to insure a good crop: and if the weather be not moist in summer, he thinks it is probably one cause of breeding the fly which is so destructive to turnip crops †.

5. *River* or *pond weeds* are capable of a similar application, and with great benefit, on loose, sandy soils intended for turnips; though it is to be observed, that such weeds have no ef-

* Sir H. Davy's Lectures on Agricultural Chemistry, p. 282.

† Sir J. Sinclair on Scottish Husbandry, Vol. I. p. 205.

fect whatever on wet springy lands, or on those which are liable to be inundated. The proportion to be laid on is twelve or fourteen loads an acre.

6. *Rape* or *cole-seed cake* reduced to a coarse powder, after all the oily particles have been expressed from the seeds, is also said to be a useful manure as a top dressing for turnips, as well as for grass-land: it is usually scattered by hand, and harrowed in with the seed of the intended crop. On account of its unusual dryness, this sort of manure is best used in *moist seasons*, when the rain disposes it more speedily to decomposition; the quantity to be spread varies from four to five quarters per acre. It should be used fresh, and kept as dry as possible before it is applied.

7. *Malt-dust*, or the refuse which is screened from malt in drying, affords an excellent vegetable manure, particularly the *black* dust; because, in this last sort, the seeds of charlock, with which it usually abounds, are completely destroyed by exsiccation. For grass lands it is very beneficial, in the proportion of sixty bushels per acre; but it is best calculated for cold clays, or stiff loamy soils, as in gravelly situations it is apt to burn the soil. Should, however, the ensuing weather be wet, malt-dust will be very useful, as it is washed into the ground by the first shower, and an abundant crop is secured, while the vegetation of noxious weeds (that are usually generated by the use of common dung) is effectually prevented. Like rape-cake, it should be used as dry as possible, and its fermentation prevented.

8. *Oak bark*, or (more correctly speaking) tanners' waste, may be accumulated into small heaps, and mixed with lime and a sufficient degree of water to keep it moist, and promote its decomposition and putrefaction. It is an excellent manure for cold, stiff soils, whether arable or grass land; but, for the latter, it should be made to approach the nature of vegetable mould as much as possible. The best time for spreading it on grass lands is shortly after Michaelmas, that the winter rains may wash it into the ground; as, if it be applied in the spring, it will burn the grass, and exhaust rather than improve the soil for that season.

9. Considerable benefit has likewise been derived from *ploughing in tares*, rape, vetches, early sown buck-wheat, and other succulent vegetables; but, whatever the vegetable may

be, it ought to be ploughed in, says Mr. Young, with a skim-coulter plough, which is the only means of turning it so completely in as to conceal it entirely from the eye. The best period of the year for this purpose is, when the plants are in flower, or just as the flower is beginning to appear, which in general is about midsummer: for not only are the plants at this period in full crop, and consequently contain the largest quantity of nutritive matter; but the warmth of the weather will also very materially promote the decomposition. "Green crops, pond-weeds, the paring of hedges or ditches, or any kind of fresh vegetable matter, require no preparation to fit them for manure. The decomposition slowly proceeds beneath the soil. The soluble matters are gradually dissolved, and the slight fermentation that goes on, checked by the want of a free communication of air, tends to render the woody fibre soluble, without occasioning the rapid dissipation of elastic matter."* The ploughing in of green crops, as a dressing for turnips, ought to be done at least three weeks before the seeds of those valuable roots are sown, when that seed should be lightly harrowed in. But *turnips* themselves, when, through any unforeseen accident, they are injured by frost, may be treated in this manner with great benefit to the succeeding crop, as they are believed to prevent the germination of the seeds of weeds found in dung; and, when stirred among the latter, the turnips accelerate their putrefaction.

When old pastures are broken up and made arable, not only has the soil been enriched by the death and slow decay of the plants, which have left soluble matters in the soil; but the leaves and roots of the grasses living at the time, and occupying so large a part of the surface, afford saccharine, mucilaginous, and extractive matters, which immediately become the food of the crop, and the gradual decomposition affords a supply for successive years.

10. *Wood soot* is a very beneficial top-dressing for cold clayey soils, which are either in pasture or laid down in tillage for grain or pulse; it is of a black shining colour, emits a disagreeable odour, and has a nauseous acid taste. It should therefore be laid on very early in the spring, in order both that the substance of the manure should be carried down to the roots of the

* Sir H. Davy's Lectures on Agricultural Chemistry, p. 280.

grass at the period of vegetation, and that all the noxious effluvia should be evaporated previous to cattle being turned upon the land: the quantity commonly employed varies from twenty to forty bushels per acre.

11. *Furze ashes* possess various degrees of strength, accordingly as they are burnt in the lime or brick kiln, or in the oven: the best, however, are indisputably those which are burnt in the kiln, on account of the calcareous matter that combines with them during the process of combustion *. On meadows that abound with coarse grass or rushes, in consequence of stagnant surface waters, the application of furze ashes burnt in the lime-kiln, will be found of great service; but for worn-out or neglected upland pastures, as also on light loams and silicious soils, ashes from the brick-kiln are preferable; and on stiff, loamy soils, with a substratum of chalk, the pure ashes, or such as are burnt in the oven, will prove very beneficial as top-dressings. The proportions, per acre, used in Surrey and the adjoining counties, are: on *light loams*, eight, and on *strong loamy soils*, for pasture, ten loads†.

CHAPTER II.

ON ANIMAL MANURES.

On account of the rapid tendency to putrefaction of animal substances, when divested of the vital principle, they have been found to afford the most ready and abundant nutriment to vegetables. The first we shall mention is,

1. *Dung*, of which that dropped by fat cattle is justly remarked by Mr. Middleton, in his "Agricultural Survey of Middlesex," to be richer, and of course to possess more fertilizing properties, than the dung of lean cattle. Thus the dung of those fed with rape, linseed, or other oleaginous seeds, is the richest: that of animals supplied with oil-cake, or those seeds

* Malcolm's Compendium, Vol. II. p. 184.

† Wherever the subject of manures is noticed, the load of 27 bushels, or one cubical yard, is intended; unless the contrary be expressed.

of which the oily matter has been expressed, is next in point of fructifying powers: then the dung of cattle fed on roots; next that of such as are supplied with hay, varying according to the goodness of their keep; and that of straw-fed cattle, especially lean beasts, is the poorest of all.

With regard to the relative powers of animal dung, it may be observed, that horse-dung, when not too new, is admirably calculated for cold, sterile, and poor ground; while that of neat cattle is better adapted to hotter soils; but both, when combined together, or with mud, form a useful manure for either of those soils.

For cold clays, the dung of swine is conjectured to be of a fatter and richer nature than that of any other beast, and is said to be particularly excellent for grass lands; *one* load of hog's dung being averred to be more fertilizing than *two* of any other animal excrement.

The pulverised dung of deer and sheep (the properties of which do not materially vary) is, in the judgment of agriculturists, best calculated for cold clays; the quantity, per acre, is from four to five loads, to be thinly scattered over the autumnal, or vernal crops, in the same manner as ashes *.

The dung of poultry, particularly of pigeons and geese, is of great service in the improvement of meadows; especially that of the last-mentioned fowls, which is asserted to contribute to the fattening of sheep in a very material degree, those animals being most partial to, and thriving best on, pastures that have been manured with goose-dung. It should be laid on as new as possible †.

Lastly, the soil, or excrementitious matter of privies, is believed to excel every other species of manure, for the first year of its application; in the second, Mr. Middleton states,‡ that its beneficial effects are less evident; but in the third, they nearly,

* The common mode, however, of applying sheep's dung is by *folding*, a practice, the utility of which has been already discussed: but it should seem, that most of the benefit thus obtained is derived from the consolidation of land affected by their treading, and from their urine: to which may, perhaps, be added the perspirable matter exuded from their fleeces while lying down upon the ground; or, as it is in some places called, the *Twathe*.

† Sir H. Davy is of opinion that, as the soil in woods where great flocks of wood-pigeons roost, is often highly impregnated with their dung, it would form a valuable manure. Lectures, p. 299.

‡ Transactions of the Society for the Encouragement of Arts, &c.

if not altogether, disappear. The proportion for land in good condition is estimated by Mr. M. to be about two loads annually; which, he thinks, will always preserve its fertility. He adds, that exhausted land may be perfectly restored by the application of four or five (Middlesex) loads of such soil on each acre for the first year, after which two loads annually will be sufficient to retain the land in a high state of cultivation; and that the herbage produced by land thus manured, is capable of fattening the largest cattle in a smaller compass of time than any other. It will, however, be advisable, on account of the generally fluid state in which the excrementitious matter of privies is usually found, to combine it with some peaty or earthy matter, which the volatile alkali, evolved by the decomposition of the ordure, may reduce into the requisite degree of solubility, for facilitating the growth of plants; thus, much benefit will be derived, both in the quantity and quality of the manure *. It has also been found highly fertilizing when mixed with water, and thrown over the land in a liquid state.

The disagreeable smell of night-soil may be destroyed by mixing it with quick-lime; and, if exposed to the atmosphere in thin layers strewed over with quick-lime in fine weather, it speedily dries, is easily pulverized, and in this state may be used in the same manner as rape cake. The Chinese method of mixing night-soil with one third of its weight of fat marl, is worth a trial. Made into cakes and dried by exposure to the sun, it forms a common article of commerce in that vast empire †.

2. *Urine*, or the liquor of farm-yards, is a fluid capable of being employed with great benefit on meadows. It should be used as fresh as possible, as the soluble animal matter it contains is destroyed by putrefaction; and, if not mixed with solid matter, should be diluted with water, as, when pure, it contains too much animal matter to form a proper fluid nourishment for absorption by the roots of plants ‡. When applied to meadows,

* For this interesting fact, we are indebted to the Earl of Dundonald's valuable Treatise on the Connexion of Agriculture with Chemistry, 4to.; a work deserving the attention of every intelligent agriculturist.

† Sir H. Davy's Lectures, p. 298. It may be procured in a compressed state, of Clarke, nightman, in Goswell-street, London.

‡ Sir H. Davy's Lectures, p. 295. Sir J. Sinclair confirms his statement. Scottish Husbandry, Vol. I. p. 81, note.

the best time for *sprinkling* urine is during the winter, when the rains will wash the fertilizing saline particles into the soil; or, the land may be sprinkled early in the spring, when it is laid up for hay; because no cattle will touch the grass, so long as the salt adheres to the blade. Another circumstance necessary to be attended to, in order to make the most of this valuable manure, is, that it be carried to the meadow or pasture, intended to be watered, in dry weather, as the farm-yard liquor in the reservoirs is at that time strongly impregnated with salts, which may be known by its deep brown tinge. Thus the reservoirs, or ponds, appropriated for its reception, may be constantly kept in a state of readiness for that purpose; while the land may be watered or sprinkled as often as the operation may be necessary.

An interesting account of an economical mode of collecting and applying the urine of cattle as a manure to land, has been communicated in No. XLIX of the "Farmer's Magazine," by an intelligent farmer, Mr. Charles Alexander, in the vicinity of Peebles. His farm buildings are so disposed, that the urine of all the stalls is conveyed by trunks to a dung-pit; and the dung is laid in a place appropriated for that use, instead of being thrown into the middle of the yard, according to the usual practice. The dung-pit is twelve yards square, and four feet deep, and is filled with mould previously carted into it, for the purpose of being impregnated with the urine and moisture from the dung. This pit produces about 288 cart-loads, forty of which are sufficient for an acre. The expense of filling the pit is calculated at about 6*l.*; so that the advantage of the method is too obvious to be mistaken.

3. Where *greaves*, or the refuse of tallow-chandlers, after making candles, the clippings or waste of curriers, fellmongers' clippings, shreds of shoemakers and furriers, and the waste or refuse of glue-makers, can be obtained in sufficient quantities, they afford an uncommonly useful manure for obtaining *immediate* crops; but their effects are by no means so permanent as those produced by other animal substances, on account of their great attraction of moisture.

4. *Fish*, such as pilchards, herrings, mackarel, muscles, and other shell-fish, afford a useful species of animal manure, to which purpose they are applied in those parts of Britain where

such fish are found in abundance. To these may be added, the refuse blubber remaining after the oil is boiled out, the offals of large fish, (great quantities of which may be easily procured in large cities or maritime districts,) and the sticklebacks *, a common fish in all rivers and ditches, of which (in some parts of the county of Cambridge) twenty bushels are strewed over an acre of land. The common mode of using these animal substances is by spreading them on the soil alone; hence much of their fertilizing properties is necessarily lost and wasted, which might be preserved (while the offensive effluvia thence arising might be prevented) by a judicious combination: first, of a little effete lime; and afterwards of double or treble the quantity of the whole of good vegetable mould. In Cornwall, pilchards are successfully used when mixed with sand, soil or sea-weed: their effects continue for several years.

5. *Bones*, broken very small, not exceeding the size of small marbles, are likewise an excellent manure upon poor calcareous soils, at the rate of sixty bushels per acre. Bone manure is used to a considerable extent in the West of Yorkshire, in Holderness, and in Lincolnshire, on cold and light sandy soils. The usual quantity is seventy bushels per acre; but when mixed with ashes, thirty bushels per acre. It is applied in the same way and at the same periods as other manure, and its effects will continue for many years; they are, however, more evident, especially upon grass lands, and more beneficial the second year than in the first.

The efficacy of bones, as a manure, has been often questioned, but all doubt upon the subject seems put to rest by an account of some late experiments published by the Doncaster Agricultural Association; except in one particular which still appears to us to require confirmation—not as to the value of bones for that purpose, but in regard to an observation, "*that boiled bones are preferable to raw.*" This is not only at variance with all our preconceived ideas, which attributed their chief value to the animal oil in which they abound—and of which the process of boiling would deprive them—but is in contradiction also to the known fact, that oily substances are powerful stimulants to fertility.

The report is a condensation of the several facts, opinions,

* The *Gasterosteus aculeatus* of the Linnæan system.

and suggestions, furnished by the correspondents of the Committee, from whence principles are deduced, in a very satisfactory manner, founded upon the fundamental maxim of the Committee, that "experience is the only guide, and theory and opinion unsafe." Nearly all the farmers are decidedly in favour of this species of manure; and although there is occasionally some apparent conflict of opinion amongst them on subordinate points, this discrepance is skilfully, and in almost every case convincingly, traced to peculiarities which do not at all affect the general principle, or impair the result at which the Committee has arrived.

The degree of utility to be derived from the use of this kind of manure depends upon the different soils, which vary not only in character, but in other particulars, such as moisture and quality, and upon its mode of application,—as the particular stage of cropping it applies to, at what period of the year, and again whether raw, or after a process of manufacture, in what quantity, of what size, and whether broad-cast or drilled. A long continuance of experiments, under the eye of judicious observers, can alone afford a safe ground for conclusion as to the efficacy of boning, and as to the proper methods; and "where a course of practice so long established as the use of bones has furnished such an amount of experiments, all doubt", says the report, "may be at once discarded."

The returns, with only two exceptions, concur in stating this manure to be highly valuable, and on light dry soils superior to farm-yard dung and all other manures. Upon very thin sand land, its value is not to be estimated: "It is not only found to benefit the particular crop to which it is applied, but extends through the whole course of crops, and even in the succeeding courses its effects are visible in the improved quality of the land, and the efficiency of a smaller quantity than would at first have ensured a crop." On dry limestone the results are equally favourable; on the light loams, it is preferable to the ordinary dressing of farm-yard dung; on the heavy loams and clays, the experiments are unfavourable. It is laid down as a necessary qualification in a soil for bones, that it should be dry; and the Committee, on this principle, consider that "the clay soils are too moist to receive any considerable benefit from bone tillage." Upon peat soils, previously laid dry, the advantages of bone manure are reported to be very striking; two unfavourable ex-

periments corroborate the soundness of the principle just mentioned: the peat was moist. The effect of this manure on gravels is differently stated in different reports; but the same principle accounts for this conflict of opinion. "A gravelly soil may embrace every variety of texture and quality, from the light dry sand to the water-logged yellow clay, preserving in each the necessary admixture of stones and grit."

Striking testimony is furnished as to the durability of this manure. One farmer says—

"On a field, part of which was boned forty years ago, the crops were on that part visibly better for fifteen or sixteen succeeding years than the remaining part, although the land was all of the same quality; and part not boned was manured with farm-yard dung." Another says, "About three acres of light sandy land were boned with 150 bushels per acre by mistake, and although it was as far back as the year 1814, the land has never forgotten it, but is nearly half as good again as the other part, farmed precisely in the same way, with the exception of the one dressing of bones."

A convincing proof of the utility of this kind of tillage may be deduced from the fact, that there is a rapidly increasing demand for bones. "In no one return," observe the Committee, "in answer to the query in our circular—do you continue to use them? has the answer been in the negative. The impression which is prevalent in our neighbourhood, that he is not to be accounted a good farmer who does not use them, is echoed from the wolds of Lincolnshire."

The most valuable part of the report consists of the practical details, derived from the experiments of the farmers who have used bones, regarding the time and manner of their application; upon which points some variety of opinion prevails, as might be expected amongst the Committee's correspondents.

Like other kinds of manure, the proper effect of bones on the soil depends upon their undergoing a certain degree of fermentation. This principle was discovered by some experiments of Mr. Horncastle, of Hodsack, who found that boiled or stewed bones were preferable to raw. The committee observe:—

"The principle thus developed naturally leads us to another of great importance, which has been elicited by the practice of intelligent farmers; and, like all principles developed by practice, the most certain and satisfactory, from its having proceeded

from no theory previously formed. It is the accurate observation of facts which leads to every practical improvement, and a classification of facts proves the only one principle which pervades them. The principle is the superiority of a compost of bones and manure or other substances, over bones used singly. The effects of such a compost are stated by thirteen of our correspondents, who present them as their own individual conclusions, and a course into which they have individually been led by experience, without having had, as far as appears, any communication with each other: such a coincidence is too regular and marked to allow us to attribute it to any accidental circumstance, and the force of the concurrent testimony is so great as to leave no reasonable place for doubt."

The results of the inquiries proposed to the committee are shown in the following summary of their deductions from the details collected. It appears—

That on dry sands, limestone, chalk, light loams, and peat, bones may be laid on grass with great good effect; and on arable lands they may be laid on fallow for turnips, or used for any of the subsequent crops.

That the best method of using them when broad-cast, is previously to mix them up with earth, dung, or other manures, and let them lie to ferment.

That if used alone, they may either be drilled with the seed or sown broad-cast.

That bones which have undergone the process of fermentation, are decidedly superior to those which have not done so.

That the quantity should be about twenty bushels of dust, or forty bushels of large, increasing the quantity if the land be impoverished.

That upon clays and heavy loams, it does not yet appear that bones will answer.

6. For chalky lands, the refuse of *horn shavings* are likewise of great advantage as a manure, in the proportion of fourteen or sixteen bushels per acre. When combined with hotter manures, and spread on light gravelly land, they afford a useful corrective of the latter, which they prevent from burning the soil; as horn shavings are found to attract the dew, and to be retentive of moisture.

7. The soiled or damaged *locks of wool*, or trimmings of

sheep, and, generally speaking, *woollen rags*, afford excellent manures; the former are used chiefly in the county of Surrey, the latter in Kent, in the proportion of from six to ten hundred weight per acre, and have been found to produce a sensible effect for several years. They require to be reduced into small pieces, then strewed upon the ground, and ploughed in about three months before the intended crop is sown.

CHAPTER III.

ON FOSSIL MANURES.

UNDER this division are comprised various kinds of earth, lime, marl, clay, &c. which vary in their effects, and all of which contribute in a greater or less degree to improve the land, according to the nature of the soils and proportions in which the fossil manures are applied, and the various articles or substances of which they are composed.

1. One of the most useful manures of this class, that has of late years been introduced into rural economy, is *crag*, or the shelly sand deposited in strata, in the neighbourhood of the British coasts. These beds are generally found in crevices and level parts of the shore, though they are often met with at the height of forty or fifty feet above the level of the sea. From the quantity of fine calcareous matter produced by the friction of marine shells, and similar substances, as well as animal matters combined with it, crag may be beneficially employed as a manure; especially as it retains a portion of sea-salt, which greatly promotes the decay and putrefaction of vegetable and animal substances. This kind of manure is best calculated for correcting cold, clayey, or loamy soils, on which it will produce most abundant and luxuriant crops: the quantity per acre is from eighteen to twenty tons, though the peculiar nature and other circumstances of soil or situation, as well as the greater or less portion of calcareous matter it contains, will necessarily cause a fluctuation in this respect. But Dr. Anderson has ob-

served, that a considerably less quantity of calcareous matter, when finely attenuated, as in the case of crag, will produce more sensible effects, than when applied in the state of earthy marl, being spread more equally upon the land, and more intimately blended with the soil.

2. *Clay*, after it has been burnt, ameliorates wet, cold, and sandy soils, and stiff, cohesive lands: this sort of manure is chiefly used in the North Riding of the county of York, where the ground is so sandy as to yield, with the application of other manures, only rye; while, with clay, such land produces abundant and luxuriant crops. The quantity per acre varies from ten to twelve loads; and so lasting are the fertilizing qualities of this fossil manure stated to be, as to render a repetition of *claying* for forty-five years unnecessary.

3. *Chalk*. Of this fossil there are two sorts: the one soft and unctuous, which supplies the best manure in its natural state, for lands; the other hard, firm, and dry, which is best adapted to the purpose of burning into lime. Either kind, however, affords an excellent manure for compact clayey soils, into the pores of which it insinuates itself; and by producing a fermentation therein, exposes the clay to the action of the sun, air, rain and frost, so that its too cohesive particles become loose, and it is reduced to a state of pulverization. But the Kentish chalk does not produce these effects on the clays of that county that are situated near the pits, though it agrees extremely well with other clays; probably, on account of the Kentish clays being of a chalky nature, so that the quality of the manure is nearly of the same nature as the soil. Chalk, however, may be very usefully employed on sandy grounds, the interstices of which it fills up, and thus renders such soil sufficiently compact for the purposes of vegetation; while it totally extirpates the pernicious *Crysanthemum segetum*, yellow ox-eye, or common marigold, a noxious weed, which peculiarly infests lands of the last-mentioned description. In laying chalk on grass-lands, care should be taken to reduce the lumps, for it may be long before the weather will pulverize them sufficiently to incorporate them with the soil; and if left on the soil they will impede the scythe. Lime, indeed, is more generally used on grass than chalk, but beneficial effects have been experienced from the latter.

4. *Coal-ashes*, when properly preserved, likewise supply an

excellent top-dressing for clover, on dry, chalky soils, in the quantity of fifty or sixty bushels per acre, scattered in March or April; and are equally beneficial on grass-lands, on which they are spread either during winter, or in the course of the following spring. The quality of coal-ashes may be much improved, by covering up in every cart-load of ashes one bushel of lime, in its hottest state, for about ten or twelve hours, when the lime will be entirely fallen. The whole is now to be well mixed together, and turned over two or three times, when the cinders, or half-burnt pieces of coal, which would otherwise be of no use, will be reduced to as fine a powder as the lime itself. It should, however, be remarked, that in order to obtain this benefit from coal-ashes, they ought to be kept perfectly dry; and when thus prepared, they are stated to improve swampy, moorish soils very materially, and in a very short time.

5. Leached or *soap-boilers' ashes* are also possessed of eminently fertilizing properties, and are particularly useful for swampy soils, as they effectually destroy rushes and other aquatic weeds.

It is only of late years that the value of this manure has been duly appreciated: and there are few soils on which it may not be beneficially employed. The quantity per acre varies from 100 to 160 bushels, according to the quality of the ashes. The soapers' waste of London consists wholly of the refuse of kelp and barilla. It yields about 91 parts out of 100 of calcareous matter: consequently it may be advantageously applied wherever calcareous matter is wanted in lands, and will serve the purposes of liming; and the small quantity of alkaline salt and gypsum which it contains, renders it much superior to common calcareous matter, as a top-dressing for every kind of grass. This waste has been found to answer, best of all manures, on a peat moss, in strong cold soils, when applied in the quantity of two or three cart-loads per acre. In Lancashire it has been found very good and durable on dry pastures, and has also been successfully used in other parts, and in various proportions. It is considered to be, generally, better for pasture than for arable, and crops of clover-hay have been more than doubled by it. The effect of this manure is, that *it also destroys slugs and vermin of every description* *.

* Communications to the Board of Agriculture, Vol. VI. Part II. See also

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s stated in the annexed

ER, IN 1800.

			Value at 6s. per cwt.		
	qrs.	lbs.	£	s.	d.
	0	0	18	0	0
20	0	0	6	0	0

VER SEED PRODUCT.

	per ch.		Clover straw per acre.			Amount at 12d. per cwt.			Seed per perch.		Produce per acre.			Value at 12d. per lb.		
	lbs.	oz.	cwt.	qrs.	lbs.	£	s.	d.	lb.	oz.	cwt.	qrs.	lb.	£	s.	d.
um	16	0	22	3	12	1	2	9	0	10½	0	3	21	5	5	0
one ..	3	8	5	0	0	0	5	0	0	2	0	0	20	1	0	0

	£	s.	d.
Amount of hay product with gypsum	18	0	0
Ditto, without gypsum ..	6	0	0
Extra value by gypsum ..	12	0	0
Deduct expense of gypsum	1	0	0
Clear gain by gypsum....	11	0	0

* Communications to the Board of Agriculture, Vol. III. p. 337.

6. *Gypsum*, or *plaster stone*, as it is sometimes termed, is a native combination of calcareous earth with vitriolic acid; which, though easily reduced to powder in the fire, is almost as difficult of fusion as lime-stone; it abounds in various parts of England. This fossil has only been introduced into rural economy within a few years; but its uncommonly fructifying properties render it deservedly an object of notice, as the subsequent facts, drawn from actual experience, will evince.

In the "Letters and Papers of the Bath and West of England Society," Vol. V., there is an interesting communication on the subject of the effects of gypsum as a manure. The correspondent states, that he covered a piece of grass land, to the thickness of two inches, with barn manure; and scattered pulverized gypsum on another piece of the same land, in order that he might compare the effects produced by each of those articles. The two pieces were mowed twice in the same year, and once in the year following, when the gypsum crop was in every instance the most productive. Exhausted sandy uplands, that had been abandoned, have been restored to a degree of fertility by the use of this fossil, whose effects on cabbages and turnips were equally beneficial: but gypsum appears to be best calculated for chalky and dry calcareous lands. The vegetable crops that appear to be most improved by the use of this manure are, clover, grass, and saintfoin. In order to apply the gypsum with effect, it ought to be previously pulverized, or reduced to small pieces by means of mill-stones, where these can be commanded; or, which is a more tedious process, by the hand with hammers. When thus reduced, it may be strewed over the land at any period of the year, in the proportion of eight or nine bushels per acre; but the most proper season for this purpose is previously to the falling of gentle showers, as these will materially promote the efficacy of the gypsum. Hence the months of February and March appear to be the most proper seasons for this purpose; and eight bushels per acre are stated by Mr. Kirwan, in his valuable "Treatise on Manures," to be fully sufficient for grass land, as a larger quantity would prove injurious to the soil.

The beneficial effects of gypsum, however, considered as an article of manure, will be more clearly evinced by the annexed

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experiments, selected from Mr. H. Smith's "Essay on Gypsum as a Manure,"* than by any deductions or inferences we could make on this subject.

Having a field of clover, part of which had not been manured with gypsum, and the produce of which was beyond all comparison inferior to that whereon the gypsum had been spread, he carefully manured two square perches, (in order that he might ascertain the precise value of the hay-crop,) within a foot of the line that separated the part sown with gypsum from the other, weighing the contents of each, and having paid equal attention to the two contrasted perches when cut for seed. The produce of these spots is stated in the annexed experiments.

EXPERIMENT ON RED CLOVER, IN 1800.

CLOVER HAY PRODUCT.

	Per perch.		Per acre.			Value at 6s. per cwt.		
	lbs.	oz.	cwts.	qrs.	lbs.	£	s.	d.
A. Gypsum ..	42	0	60	0	0	18	0	0
b. None.....	14	0	20	0	0	6	0	0

CLOVER SEED PRODUCT.

	Clover straw per perch.		Clover straw per acre.			Amount at 12d. per cwt.			Seed per perch.		Produce per acre.			Value at 12d. per lb.		
	lbs.	oz.	cwt.	qrs.	lbs.	£	s.	d.	lb.	oz.	cwt.	qrs.	lb.	£	s.	d.
A. Gypsum	16	0	22	3	12	1	2	9	0	10½	0	3	21	5	5	0
b. None ..	3	8	5	0	0	0	5	0	0	2	0	0	20	1	0	0

	£	s.	d.
Amount of hay product with gypsum	18	0	0
Ditto, without gypsum ..	6	0	0
Extra value by gypsum ..	12	0	0
Deduct expense of gypsum	1	0	0
Clear gain by gypsum....	11	0	0

* Communications to the Board of Agriculture, Vol. III. p. 337.

	£	s.	d.
Amount of gypsum, seed value	5	5	0
Ditto, without gypsum ..	1	0	0
Clear gain by gypsum ...	4	5	0
Amount of gypsum, straw value	1	2	9
Ditto, without gypsum ...	0	5	0
Clear gain by gypsum	0	17	9

Total clear gain by gypsum, viz.

	£	s.	d.
By hay-crop	11	0	0
By seed	4	5	0
By straw	0	17	9
Total gain	16	2	9

"Thus there is," says Mr. Smith, "16*l.* 2*s.* 9*d.* clear gain from five bushels of gypsum: he also states that, exclusive of this clover, he had ten acres of lucerne, five acres of saintfoin, and three acres of Dutch clover, dressed with five bushels per acre, which to all appearance received equal benefit. Before we conclude this article, we would add, that Mr. S. conceives five or six bushels per acre to be amply sufficient on very weak and exhausted soils; and as pot-ashes are used in extracting the vitriolic acid from this fossil, he conjectures that some part of the alkaline salt is imparted to the calcareous earth, and that thus we may account for the uncommon effects of gypsum upon chalky soils. But the celebrated practical chemist, Mr. Kirwan, deduces the theory of the effects of gypsum from its uncommon septic properties, though this theory has been questioned by the late Dr. Darwin; because it promotes putrefaction in a higher degree than any other substance. Hence he observes that it ought on no account to be *ploughed in*, but simply scattered or sown on the surface of the land, in order that the old grass may be quickly converted into coal, to nourish the young vegetables."

We have inserted the foregoing account of Mr. Smith's experiment, in order to shew what has been accomplished by the application of gypsum: but many other trials have produced less favourable results; and although it may be generally recommended as a valuable top-dressing for clovers, yet it must be admitted that it has frequently disappointed the expectations formed of its effects.

7. *Lime* is another article in the mineral kingdom which is of extensive utility for manuring lands, both in its native state, and also after it has been burnt. Its effects, however, vary

greatly, according to the nature and quality of the substances with which it is combined; for where magnesia is in unison with the calcareous matter, (and limestone of this description is found chiefly in the counties of Derby, Northumberland, and Nottingham,) its beneficial effects are by no means so great in fertilizing the soil, and consequently in promoting vegetation, as where such combination does not exist, particularly when the *same* quantities are spread on land *.

On this account, therefore, as well as on account of the siliceous or sandy particles that are sometimes found in union with limestone, it is most advisable to burn it in a kiln; which is effected by depositing therein alternate strata of turf or coals and limestone, and the kiln being carefully closed, the process of calcination will be completed in about four hours. Formerly, indeed, a longer time was allowed for this purpose; but the excellence of lime as a manure depending on its re-attraction of fixed air from the atmosphere, and it having been found by experiment, that lime burnt four hours has a much greater disposition to recover such fixed air, than that which has been twenty-four hours in combustion, the operation of burning should be regulated accordingly.

The process of calcination will, at the same time, afford a certain criterion by which to judge of its goodness. Thus, if its weight be thereby materially reduced, and the lime-shells be extremely light, requiring much water to slack them fully; if a long time elapse before they begin to *fall;* if the limestone be not apt to *run*, or become vitrified during combustion; if it *fall* entirely, when sufficiently moistened with water, after it has been properly calcined; if, in the operation of slacking, it swell greatly; and, if the lime be light, of a fine white, and fine to the touch; in all these instances, Dr. Anderson observes, that the farmer may rest perfectly satisfied of its goodness, and may use it preferably to any other lime, which may be inferior to it in these respects †. And as lime effervesces with any of the mineral acids, except the sulphuric or vitriolic acid, the facility or difficulty of effervescence, together with a careful inspection of the residuum, will (as the same practical writer has

* For this valuable and interesting discovery, we are indebted to an ingenious essay, by S. Tennant, Esq., in the Philosophical Transactions of the Royal Society, for 1799.

† Essay on Agriculture, Vol. I.

remarked) afford a certain criterion for ascertaining the relative purity or impurity of the different sorts of lime.

Much caution is necessary in the use of native limestone; nor should it, indeed, be ever employed on any soil without duly considering and accurately weighing the nature of the latter. In fact, it will be most advisable to use it in a calcined state in all cases, unless there be a scarcity of fuel for the purpose; and, in such event, it ought to be attenuated as finely as possible, by stamping or bruising to pieces in the best manner of which circumstances will admit.

After the lime has been perfectly calcined, as already intimated, it receives the appellation of quick-lime; and ought to be spread as expeditiously as possible, in order that it may be duly slacked and blended with the soil. This fossil is calculated for almost every soil, but more especially for boggy, peaty, swampy, heathy, and mountainous situations; on waste lands which are overrun with fern, broom, bushes, furze, rushes, &c., and which contain a large portion of coarse vegetable matter, though, from the nature of the plants that cover their soil, they have contracted an acidity unfavourable to vegetation; on rich loams abounding with vegetable matter, the general putrescency of which is promoted by the lime, so that such soils prove uncommonly fruitful; on old sheep-walks and commons; and on low rich drained meadows, which have formerly been marshes, and which contain a very considerable quantity of vegetable matter. For the lime, in all these cases, uniting with the soils, corrects them by accelerating putrefaction, and dissolving or removing thence every thing that is noxious or hurtful to vegetation. But on strong, stony lands, or such as are situated upon quarries of lime or other stone; and on stiff, wet loams, which retain moisture, and are not properly drained, lime produces little benefit.

The quantity of lime usually spread on land varies according to the influence of local custom; indeed, numerous intelligent agriculturists have used from one to six, and even seven hundred bushels per acre, on different soils, and with various degrees of advantage resulting from this management. Much, however, must depend upon the goodness of the lime, and the nature of the soil to which it is applied. The general allowance, in the estimation of experienced farmers, should be at least three or four hundred bushels an acre, particularly where lands have for a long time been in a neglected and un-

cultivated state; in which case, one good application of lime proves more beneficial than the frequent and repeated scattering of small quantities. Mr. Young thinks that, for common soils, which are not impregnated with acids, or do not abound in putrescible matters, one hundred and sixty bushels will be sufficient for one acre; which quantity, however, he conceives, should be increased in a double or treble proportion in the case of strong and stiff clays.

As lime, when applied without the addition of any other manure, is said to exhaust the soil, it has been suggested to form small heaps, and cover these with earth; when the lime is slacked by the moisture of the soil, the piles or heaps are directed to be opened, and as much dung deposited in each as the earth will cover. A better mode of correcting the too caustic properties of lime is proposed by Mr. Andrews *, who directs one hundred and forty loads, each load containing forty bushels, of moist dung to be thrown up into heaps in December, and then to incorporate two hundred bushels of lime. At the end of three months the mass is to be thoroughly stirred; and, by this method of treatment, the seeds of weeds usually found in dung will be effectually destroyed, while the increased fermentation, thereby produced, more speedily excites the fertilizing qualities of the dung.

The expense of liming necessarily depends upon the expense of fuel for burning, and the distance of carriage, so that we cannot specify any criterion on this point. We shall therefore observe, in addition to the facts already stated, that lime destroys snails, slugs, and other insects, which abound on almost every soil; and though, as already intimated, it may not be proper for clayey lands, yet it was the opinion of the late Dr. Darwin, that if it were properly mixed with such soils, they would become less cohesive, and consequently be more easily penetrated by vegetable fibres. Lastly, as lime is an excellent corrector of acidity, it is peculiarly calculated for those grass lands, the produce of which is so rank and sour as to be refused by cattle; so that if a handful of lime, for instance, be thrown upon a tussock, or spot of long rank grass, that has been rejected *for years*, cattle will afterwards eat it close to the ground.

The phosphoric acid and lime, one proportion of each, when

* Annals of Agriculture, Vol. IV.

combined together, form *phosphate of lime:* it forms the greatest part of calcined bones; exists in most excrementitious substances; and is found both in the straw and grain of wheat, barley, oats, and rye, and likewise in peas, beans, and tares. It is rarely found in a native state, and then only in small quantities. Phosphate of lime is generally conveyed to the land, in the composition of other manure, and it is probably necessary to corn and other white crops *.

8. *Marl* is calcareous earth, found in different parts of this island, in various forms, and blended with various substances; according to which it is differently called stone-marl, argillaceous or clay marl, and shell marl. The first is so denominated from its being of a harder consistence than the other sorts, on account of the greater or less quantity of sandy particles it contains; of the second kind clay is a principal ingredient; it is of a gray brown, or reddish brown tinge, sometimes intermixed with blue and yellow. In shell marl, the chief component is a decomposition of shells, effected in a long course of years, blended with a small portion of earthy matter. The strata, or beds, where this mineral is found, are from two to twelve feet thick, and at various depths below the soil. But all these varieties of *genuine* marl agree in effervescing with acids (the best test for examining them) falling in water, crackling in fire like salt, and becoming pulverized on exposure to the atmosphere.

The best season for applying this manure on lands is in the months of January and February: the quantity varies according to the nature of the soil. For sandy light lands, the argillaceous marl is preferable, as the stone and shell marl is best calculated for stiff, clayey, and loamy soils. The average allowance for sandy ground, Mr. Young states to be about fifty or sixty cubical yards per acre; but on loose, wet loams, (which are greatly benefited by the use of marl,) it should be spread to the quantity of 100 yards. Much attention, however, is requisite in this respect; as, if too large a proportion be spread at one time, there will be a difficulty in removing it; whereas, if too little appear to have been spread, the deficiency may be easily remedied by resorting to frequent light dressings.

On account of the expense attendant on marling, this mode of manuring is best calculated for inclosed lands, which it has

* Sir H. Davy's Lectures, p. 336.

been recommended to lay down with clover, rye-grass, and trefoil, in the spring, twelve months before the application of the marl, and to remain at least six months after it; that it may have time to sink and eat itself into the *flag*, before it be ploughed up, when there will be little or no danger in losing it, being already in some measure incorporated with the soil. Every attention should also be given to break all the lumps, and get it fine by repeated harrowings and rollings, and having all the stones picked and carried away, in order that the grass may shoot up as soon as possible, that stock may be grazing upon it. So permanent are the fertilizing properties of marl, that if it be properly spread on land, its effects will be visible on arable for twelve or fourteen years, and on pasture during a much longer term.

Where no marl-pits exist, or this fossil cannot be procured but at an expense by no means commensurate with the benefits that would be derived from it, a good artificial marl may, it is said, be formed by mixing equal parts of lime and pure clay in alternate strata, so as to form a heap, which is to be exposed to the winter frosts. This compost is asserted to be calculated for light lands, and little inferior to the genuine marl; but for strong and heavy soils, it will be necessary to mix loam and sand with the lime, in lieu of clay.

9. *Salt* is another fossil manure, of singular utility to pasture lands; on which, when it is properly scattered, cattle thrive very speedily: besides which, it not only improves and increases the herbage, but also sweetens sour pastures, while it destroys weeds and noxious vermin. The most accurate proportion is stated to be sixteen bushels per acre; for if that quantity be exceeded, its beneficial effects will be diminished, and vegetation be completely checked: but the general knowledge of this manure is at present in its infancy, for want of more trials being satisfactorily made *.

* Sir H. Davy thinks it not unlikely that the same causes influence the effects of salt as those which act in modifying the operation of gypsum. Most lands, in this island, particularly those near the sea, probably contain a sufficient quantity of salt for all the purposes of vegetation; and in such cases the supply of it to the soil will not only be useless, but may be injurious. In great storms, the spray of the sea has been carried more than fifty miles from the shore; so that, from this source, salt must often be applied to the soil. He has found it in all the sand-stone rocks which he has examined, and says, that it must exist in the soil derived from these rocks. It is a constituent, likewise, of almost every kind of animal and vegetable manure. Lectures, p. 339.

10. *Sand* is reputed to be an excellent manure for moorish or swampy lands, in the proportion of 160 loads per acre; and for clayey soils, in the quantity of forty or fifty loads. *Sea-sand* (the farther it is brought from the high-water mark the better) is the best calculated for this purpose; and next, in point of quality, is the sand washed down by heavy showers on gravelly soils: the other light dry sands, being liable to be drifted about by every breeze of wind, are of no use whatever. Sand was formerly used to a considerable extent in the southern parts of Devonshire and the West of England; but it has been gradually relinquished, and will probably be soon entirely superseded by Lime.

11. *Soot* from coals is preferable to that obtained from the burning of wood: it is a very powerful manure as a top-dressing, and answers best on light, dry, chalky soils, and in moderately wet seasons; but produces little benefit on strong, wet, clayey lands, or in very dry seasons, unless it be sown earlier than usual. The quantity per acre varies, like wood ashes; but, where no other manure is used, thirty bushels are reckoned a complete dressing: it is sown in the same manner as seed-corn is committed to the ground.

CHAPTER IV.

ON FLUID MANURES.

FLUID MANURES comprise water, mud, urine *, and, generally speaking, all liquid matters, which are, or may be, profitably converted to the manuring of land.

The best methods of employing water for this purpose have been stated in a former part of this work †, as well as the advantages resulting from *warping* land ‡. Here, however, we would observe, that *flax* and *hemp water* promises to be a useful fluid manure. "In Yorkshire they observe, that the grass grows doubly where flax is grassed, which shows that all the

* On the Application of Urine, see p. 585.
† Book VIII. Chap. XI.
‡ Book VIII. Chap. XII.

putrid water of the pits should be used as manure.—Mr. Billingsley carted flax water on his land, and the effect was extraordinarily great. Indeed all putrescent fluids, as well as animal substances, are found to possess fertilizing properties; and, therefore, wherever convenient ponds or reservoirs are on a farm, one at least should be half filled in summer with green weeds for the putrid water, which would soon be the result."

With regard to *mud* (which term includes the sweepings of streets and roads) rendered fluid by rains, particularly the miry sediment found at the bottom of ponds; it is improbable, as Mr. Young has justly remarked, that *pond-mud*, especially if there be a stream running into the water, should ever fail of proving a good manure, when used with judgment. The mode of using it, which has been found most advantageous, is as follows:—

As soon as the mud is dry, and sufficiently hard to split, it should be turned over; and, at the end of three or four weeks afterwards, an equal quantity of chalk or marl is to be mixed with it; the chalk being either carried to the mud, or the reverse, as convenience or other circumstances may require. If lime can be had at a cheap rate and in abundance, the addition of one-fourth part of lime to the mud will prove of great benefit. The whole must be well incorporated, and continue from June (the usual season for this work) until September, when it should be again turned over, and spread upon pasture or meadow land in October *.

The best mud for agricultural purposes is that taken from ponds which have received the draining of farm-yards; to which may be added the scourings of old ditches, which chiefly consist of decayed vegetable matter, and the sweepings of London streets; both of these, however, require to be mixed with horse-dung, in order to promote fermentation, before it is spread upon the land. Thus prepared, mud forms an excellent top-dressing for grass-lands; but it ought on no account to be spread in too great quantities, or too thickly at one time; otherwise it will retard the growth of grass, and consequently prove detrimental, rather than of service, to the ensuing crop. Ten or twelve loads per acre are said to have been carted on lands with the most beneficial effects.

* Farmer's Calendar, p. 671.

CHAPTER V.

ON COMPOUND MANURES.

MANY years have not elapsed since manures, combined of different materials or substances, have been known to the agricultural world, under the names of *composts*. Of their utility no doubt can exist, since it has been proved, by actual experience, that the mixture of such matters as are calculated mutually to act upon each other, and are adapted to the different states of land, are eminently useful in increasing its fertility, as well as accelerating the growth of vegetables.

The best composts are those which are made from a mixture of animal substances with earth. Formerly it was the practice to make composts in *layers*, by which means much of the strength of the manure was necessarily wasted, before it could be spread on the land; it is, however, a more economical method, first to mark out the spot or yard, next to cover its *concave* bottom four or five inches deep with very tough clay, and then to cover this stratum with strong gravel, well beaten in, to prevent its removal when the manure is taken out. Into this spot should be conveyed a quantity of earth, taken either from the top or under surface, and of a quality adapted to the land to be manured; that is, for compact, stiff, clayey soils, *sand;* and for open, porous, sandy ground, *clay:* it will also be necessary to cut down and collect all the weeds about the farm, before they seed, (to which may be added the deciduous leaves of trees,) into the yard, where the putrefactive process may be completed by the aid of lime, in the manner already mentioned. After thoroughly breaking the several materials, (such as saw-dust, offal, bones, waste, or refuse fodder, the refuse of blubber after extracting train-oil, and in the cider counties the refuse of apples and pears after making cider and perry,) they may be laid in heaps around the space marked out for the compost heap, a man being placed between each two heaps, to throw the manure spreading upon the space. Thus the compost heap will be shortly raised to the requisite height; and, the various ingredients being thoroughly mixed, the whole will ferment, and in the course of two months will incorporate as fully as the

ON FLUID MANURES.

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the water has so drained off, wooden troughs, or
s well paved with gravel well pounded, or with lime and
gravel mixed with boiling hot lime-wash, and spread with a
trowel, may be advantageously made, for the purpose of conveying the liquor to a tight barrel, or hogshead, in the ground, whence it may be thrown upon the heap at a leisure time; and consequently the fertilizing liquor will be prevented from losing its properties by evaporation.

Such a compost, it is observed, may be made to suit any kind of soil, by duly apportioning the ingredients; and is peculiarly excellent for meadow or pasture grounds. But where these lie at a considerable distance, or the earth intended to be mixed with the compost must be brought from a considerable distance, much time and expense of carriage may be saved, by making a compost heap on the headlands of the fields intended to be manured. The best situation for this purpose is upon level ground; or, if it be unavoidably upon a descent, a trench should be cut on the lower side to receive the oozing, or running, from the heap, which may be occasionally thrown upon it as already stated. The proportion of compost allowed to each acre may be calculated at from sixteen to nineteen or twenty

* Farmer's Calendar, p. 98.

loads, though the nature of the soil, and other circumstances, may require either a smaller or a larger quantity.

CHAPTER VI.

ON THE PRESERVATION OF MANURES.

As manures are of such indispensable necessity to the farmer, and dung is in general so important a manure, every possible method should be taken, not only to prevent it from being wasted, but also to improve it both in quality and in quantity. In no way are manures more wasted, than by too great exposure to the sun, air, and rains; hence various expedients have been resorted to, in order to prevent this loss. Such, for instance, are the mixing of dry earth, or other absorbent substances, which certainly will, in a great measure, prevent this inconvenience; the erection of slight sheds over dung-heaps with the same intention; the covering of these heaps with turf sods, (the *grassy side* being *downwards*,) when the dung is to be kept till it be old; are by no means bad practices, as the turfs will, in the course of time, be converted into excellent manure.

The farm-yard is doubtless the most convenient place for forming *dung-steads*, or *dung-meers*, or *mixen*, as the repositories for this useful article are variously termed. For middle-sized farms one will suffice; for larger farms two or more will be necessary, for the proper management of dung. According to the usual practice, a pit is dug sufficiently deep to hold the soil which the farm may require; and into this are thrown waste fodder, fern, straw, leaves, coarse grasses, thistles, rushes, flags, and similar aquatic plants; litter, scrapings of the yard after rain, sweepings of the kitchen, bones, ashes, shells, woollen rags, weeds, &c. which lie there and rot, until they are wanted for use. It has, however, been suggested by the late Dr. Darwin, to dispose the heap of dung on a gently-rising eminence, with a basin beneath, for collecting the superfluous water that may ooze from the heap. We would add, that if a shady spot can-

not be obtained for this purpose, a slight shed should be thrown over the dung-stead, to prevent too much exposure to the sun, air, and rain; and that gutters should be so contrived, that all the waste water and urine of the yard, greasy water, bloody water in which meat or fish has been washed, old useless brine, the suds and waste water of the farm-house—in short, every possible kind of liquor that may be useful—may flow through them into the reservoir, or basin, and be preserved. Dr. D. further states, that some earth, weeds, saw-dust, offals, or other vegetable or animal excrement, should be thrown into such reservoir; which will, in consequence, promote the fermentation and putrefaction of the substances therein contained, at the same time that the draining from the dung-heap will not be dissipated.

The necessary depôts for manure being thus prepared, it will only remain for the farmer to avail himself of every possible matter, both of the vegetable and animal kingdom, for increasing and improving its quantity and quality. In addition to the various articles enumerated in the preceding paragraphs, we would observe, that before the winter or foddering season commences, the surface of the cattle-yard may be raised by spreading thereon dry swamp-mud, pond-mud, the dry scrapings of roads or ditches, and similar matters that can be procured. On this stratum may be spread a little lime, for the more speedily accelerating the decomposition of the litter, fern, and other tough vegetables that may be thrown upon it for that purpose; and, in case the season should prove too dry, the decay of the vegetable matters may be promoted by sprinkling them occasionally with water from the pump, or (which is preferable) with some of the liquor from the reservoirs at the bottom of the dung-steads. Every previous arrangement being thus made, the cattle ought to be kept within their yards throughout the winter season: where they are numerous, the surface of the yards may be removed to the dung-meers, and laid down afresh in the manner above mentioned. But when cattle are kept out in such yards, without sheds, the greatest care should be taken to keep them dry; which is difficult, if the manure be allowed to accumulate. The common method is to form the centre of the yard nearly concave, so as to receive the drainage from the surrounding sheds and stables, which being covered with litter, and trodden by the cattle, soon brings the

whole mass into a fit state for the dung-heap, and this, so far as the object of manure alone, is an excellent method; but the health of the cattle is a far more important consideration, and therefore whenever the litter has become completely saturated, it should either be covered with dry straw, or removed. A still better plan, is to have pipes communicating from the centre of the yard with a reservoir.

With regard to increasing the quantity of manures, agriculturists are by no means agreed as to the point of allowing litter for their beasts to lie on, or of consuming their whole stock of hay and straw, and placing the floors in such a direction, that they may be kept clean by sweeping only, so as to render litter of any sort unnecessary. The latter practice was adopted by the late eminent breeder, Mr. Bakewell, is sanctioned by many eminent farmers, and, it is obvious, must produce the largest quantity of animal manure, from the straw and coarse food being consumed by lean beasts, while the richer and more succulent is eaten by the fatting beasts, whether neat cattle, sheep, or lambs. Both practices, however, may perhaps be united with advantage, where the surface of the yard can be raised in the manner above mentioned.

The augmentation of manure necessarily increases in proportion to the nature of their food. We have already pointed out the various articles of the vegetable kingdom that are best calculated for feeding and fattening cattle*; and, we trust, have fully evinced the superiority of *soiling*, both as it respects the economical consumption of food, and also the production of manure. The quantity of manure, afforded by a farm, may likewise be materially increased by having *standing sheep-folds*. For this purpose, in Flanders, the ground is marked out, and spread with dry sand, four or five inches thick; on this are erected slight sheds, in which the sheep are housed at night, a small quantity of fresh sand (for which dry peat, or any of the earthy materials above stated, may be substituted) being laid on every evening. This is cleared out once a week, and carried to a dung-hill or spread upon the soil. The manure thus produced is admirably calculated for fertilizing almost every kind of ground, and in fact makes an excellent dressing for cold and stiff soils.

* Book I. Chap. X. and XI., and Book IX. Chap. VI.

In the opinion of an eminent agriculturist, the most effectual method of raising a supply of manure for land situated at a distance from great towns, consists in raising green crops for the purpose of feeding sheep, bullocks, or other animals on the land; for this he considers is the only method by which the loss of nearly all their urine and dung, that unavoidably occurs under other systems of management, can be prevented; as there is a great waste, perhaps of half (including dung and urine), in the stables, cow-sheds, fold yards, and dunghills, even under the best management. Under ordinary management, three parts of this manure are lost; but in the soiling of tares, turnips, cole, clover, &c. in the fields, there is NO loss; the whole is immediately applied, without the cost of carriage, to the enriching of the soil*. It is obvious, however, that much of the ameliorating properties of those manures must necessarily be lost by evaporation, and otherwise be materially diminished; so that although the soiling of sheep with turnips may be carried on with great advantage on light lands; yet, upon the fullest view we can give the subject, we are decidedly convinced that, under proper management, stall-feeding of heavy cattle is the most effectual mode of obtaining the largest possible quantity of animal manure.

Dung-steads may be tended, and the respective manure augmented at different times, when no other business of greater moment stands in the way; and to prevent the heaps from being too much torn or spread about by the scratching of poultry, or by swine, they should be surrounded by pens, made of broad deals. In wet seasons it will be advisable to throw a slight shed over the dung-steads; and, if the heaps do not ferment so expeditiously as could be wished, it may be useful to turn them over once or twice in the course of the summer; thus they will become more thoroughly mixed and mellowed, and rendered sooner fit for use, while the seeds of weeds therein contained will vegetate and be destroyed.

The following method of making dung-hills, as practised in Middlesex, we give from Mr. Middleton's interesting Survey of that county; and, from its judicious arrangement, it has a just claim to the attention of agriculturists.—In the first place, all the scrapings of roads, mud of ditches and ponds, and

* Middleton: Transactions of the Society for the Encouragement of Arts, Vol. XVII.

the top mould of gravel-pits, are spread in the most convenient spots, as bottoms for dung-hills; on these layers is carted all the dung produced on the farm, together with the whole of what can be obtained from London, and the various inns on the road: to which materials are occasionally added chalk, ashes, soap-boilers' waste, bricklayers' rubbish, &c. In this state the mass or heap continues till within one month of the time for manuring the land; the whole is then turned and thoroughly mixed together, the larger clods being broken into small pieces, and the drier parts being thrown into the middle. In consequence of this management, the mass becomes more intimately blended, and the putrefactive process is completely finished, while the matters remain in a heap. At the same time, by this method of forming the bases of dung-hills, the fertilizing liquor which distils during the fermentation and heat that necessarily ensue, is effectually preserved, and greatly contributes to ameliorate the soil.

The most proper situations for dung-hills are contiguous to the stables and ox-stalls, to which another may be added near the house and piggery. They may be tended and augmented at odd times, when no other business, requiring particular attention, stands in the way. The *dung-meer* adjacent to the house, especially, may be easily composed of various rich and fertilizing ingredients besides dung. Thus the scrapings of the yard, after rain has fallen, may be advantageously thrown in; as also may some of the nearest earth, swamp mud, straw, weeds, the dung of fowls, soot, and ashes, shells, lime, and bones; the sweepings of the kitchen; oil dregs and any fatty matters; woollen rags; bloody water, in which meat or fish has been washed; greasy water; suds; ashes, even when the ley has been extracted from them; old useless brine; urine; and, in short, any animal or vegetable substance that does not contain too much acid; though even acids may be employed, if their properties be counteracted or overbalanced with abundance of alkaline substances.

The dung heaps, contiguous to the barn or cow-houses, may be augmented with some of the nearest soil, mud, weeds, &c.; but, in every case, it will be proper that those ingredients predominate in each heap, which are best calculated to ameliorate the land on which it is to be laid. Hence it will be necessary to acquire a knowledge of the nature of the various manures;

but as this subject has been already discussed, we shall conclude this article with observing, that if the waste liquor be thrown from time to time over the heap, it will contribute to increase the fertilizing properties of the dung. That process, however, will not take place so rapidly as it ought, unless the heaps are shovelled over once or twice in the course of the summer; by which means the various ingredients will be more intimately mixed and mellowed, and consequently the sooner fit for use; while the seeds of weeds therein will vegetate and be destroyed.

It is, further, of great importance to have either a pavement or good road all round the farm-yard and dung-pit: as farmers suffer more than is commonly imagined, by having their carts and cattle straggling in farm-yards, through piles of straw, where this is neglected. It is also desirable to have two reservoirs for urine, where cattle are stall-fed in any number: as soon as one of these is full, it should remain in that state till it becomes putrid, previously to its being taken away, and the other may in the mean time be filling.

CHAPTER VII.

ON THE APPLICATION OF MANURES.

As manure is essentially necessary to the improvement of land and to promote the growth of plants; while its fermentation and warmth dispose the soil for the more easy admission of moisture from the atmosphere, and thus ultimately contribute to the support of human existence; the mode of applying it to the greatest advantage is a subject every way deserving of attention. In the preceding discussion of the various articles capable of being employed for this purpose, some hints as to their general application have necessarily occurred; but, beside these, there are other circumstances to be regarded, viz. the crop—whether tillage or grass—the nature of the land

whereon the manure is to be spread, and the state of such manure at the time it is to be employed; on these points we now proceed to state some remarks derived from the experience of the most intelligent agriculturists.

With regard to the *state* in which manures are to be spread on the land, it appears, that those soils which are intended for the production of crops that speedily attain their full growth, derive the greatest benefit from the application of such manures as are thoroughly reduced by the completion of the putrefactive process; of this description are grass-lands and meadows, which more immediately claim our attention. On the contrary, where vegetable crops are longer, both in point of duration and also before they arrive at maturity, those sorts of dung, or manure, which have undergone the least change or decomposition, are most beneficial: to this class belong tillage-lands in general, especially stiff clayey soils: and hence the turning in of green crops has been recommended by many respectable agriculturists as a very beneficial practice. Lord Kaimes *, indeed, disapproves of ploughing down buck-wheat, clover, or any other crop for manure; and conceives the best way of converting a crop into manure, to be by passing it through the body of an animal, as the dung and urine will enrich the ground more than ploughing in the crop; and if to this be added the profit of feeding off the crop, little doubt can be entertained of the correctness of his lordship's opinion.

In regard to the *time* or season for manuring land, whether it be spread simply upon the surface, or ploughed down into the soil, it is difficult to state the precise period; because the peculiar convenience of the agriculturist, together with the condition of the land, must always influence his practice. In general, however, the following points will afford a criterion by which to regulate the application of manure:—

I. The land should be dry, in order that it may be fit for the reception and retention of the unctuous parts of the manure; although this circumstance may admit of a slight variation. Thus, in the case of grass or meadow-lands, which require the manure only to be strewed or spread *on the surface* of the soil, it will be best to apply it a short time before the grass, &c. shoots upwards from the ground. On

* Gentleman Farmer, p. 258.

the contrary, where it is deposited *in* the earth, the most proper time will be immediately before sowing the seeds for whose nutriment the manure is destined to serve; because, as Dr. Darwin excellently remarks, the atmospheric air that is buried with the dung, in consequence of its union with the carbon in the cavities or interstices of the earth, gradually evolves a genial warmth, which greatly accelerates vegetation.

II. The manure ought to be spread without delay, (in fact as soon as may be practicable after it has been carried to the field,) and dispersed as equally as possible. For this purpose, the labourers and implements should be ready on the spot. The loads should be regularly arranged in *lengths*, or rows, and the dung or compost be immediately turned in, as it more readily dissolves in the ground when newly covered, and its whole strength is thus secured to the soil.

III. Further, the manure should be speedily mixed with the earth, and buried at a proper depth, lest the oily and nutritious particles should evolve and be dissipated. On the coarser soils, therefore, from three to four inches would be a sufficient depth; though the manure may be set much deeper in the more porous and friable sorts of land.

IV. In order to prevent an undue evaporation from taking place in hot weather, some caution should be observed, that the strength of dung be not diminished by carting out more from the dung-stead than can be properly dispersed shortly afterwards, or by shovelling it more than is absolutely necessary, in hot, windy, or dry seasons. On the contrary, if this business be performed in calm, serene, or in cloudy weather, the volatile parts of the manure will not evaporate in any considerable degree. Further, when the farmer has carted away his dung-heaps from his yards, he should take up an inch or two of the surface ground beneath, unless it be rendered impenetrable to moisture; because, ordinarily, much of the strength of the dung and urine has passed into it, and made it a good manure.

V. The manure ought to be invariably proportioned to the nature of the soil; because if too much dung be laid on a warm and light soil, it imparts to the latter a still greater degree of heat, which in a measure burns up the grass;

and, on strong soils, too large a quantity will make the plants shoot up with too much luxuriance, in which case they rarely attain to perfect maturity.

In the former part of this Book, the various natures of the different sorts of manures, together with the soils to which they were peculiarly applicable, have been stated, so that little perhaps can be said in addition on this head. In order, however, that manures may be duly proportioned to the soil, it may not be useless briefly to recapitulate :—

1. That the wetter, and consequently the colder, lands are, the more dung they require; because their cold nature should be corrected by the warmth of the dung.
2. On the contrary, a less proportion of dung will be sufficient for drier soils, lest the too great heat should burn up the plants.
3. For cold, stiff, loamy clays, which are liable to become too solid and impenetrable to the fibres of vegetables, the manure ought to be employed before it be perfectly decomposed, as it will thus prevent the surface from becoming too solid and firm; and notwithstanding the putrefaction will in some degree be retarded, yet the fertilizing substances will, at length, totally decay, and afford to the roots an equal, though more gradual supply of nutriment.
4. Vegetable earth or mould being, in general, of a drier nature than the preceding sort of soil, does not require so large a quantity of dung.
5. Sandy lands being naturally hot, and superficially covered with a still hotter layer or stratum, require dung that is perfectly decomposed and putrefied, though indeed, manures in an imperfect state of decomposition may be applied; they should, however, be laid on in smaller quantities at one time, and oftener. Such soils are greatly improved by *folding*; but the dung thus applied should be mixed with the soil as soon as possible, or its most fertilizing particles will be evaporated.

With regard to the manures which are spread on the surface of grass-lands as top-dressings, the proper season for laying on the coal-ashes, soot, lime, wood-ashes, malt-dust, &c. usually employed for this purpose is, as early in February as may be conveniently practicable; for, in general, those articles are spread in too small proportions to require a whole winter's

rains to wash them into the soil; whereas, by dispersing them over the soil in a state of coarse powder, or in small lumps that cohere but slightly, the vernal showers will wash them into the soil, so that the stems of young grass may easily shoot upward through the ground. But, where a second harvest of hay is to be made, and the weather is not too hot, another top-dressing of perfectly-reduced manure may be applied, with considerable benefit to the crop.

Grass-lands may be much ameliorated, both in the improvement of the herbage, and also in the amount of the produce, by laying on the manure previous to the operation of scarifying*: it thus sinks into the incisions, and is more advantageous than if the manure were applied, without cutting.

After the grass is mown, some farmers give the land a dressing of dung, usually in September, and this operation ought not to be deferred beyond October. Where composts are used the end of September is perhaps the best season for using them; the proper quantity is about fifteen or twenty cubic yards per acre, every fourth year, unless the pastures be very rich; a pound of common salt being always mixed with each cubic yard of compost in turning over.

In a preceding page, the practice of ploughing in manures on arable land a short time before grasses, or the seeds of other vegetables are deposited in the ground, has been mentioned as conducing to promote their respective growth. There is, however, another advantage resulting from this mode of manuring land, viz. that, as the whole is thus made to nourish the vegetables in an immediate and direct manner, a *smaller quantity* will be fully adequate for this purpose; and as the collecting, preserving, and augmenting of manures is necessarily attended with considerable expense, it certainly behoves every intelligent agriculturist to employ it in the most economical way. This object is in a very great measure attainable by adopting the drill husbandry, one principal advantage of which consists in depositing the manure in *drills*. Mr. Parkinson† observes, that such drills should be made two feet asunder, each being six inches wide at the bottom; thus he sows peas, beans, &c.; from the result of which he asserts, that in consequence

* See Book VIII. Chap. III. p. 424.

† Experienced Farmer, Vol. I. p. 32.

of the manure being thus kept closely together, and the seeds being placed immediately upon it, four loads will perform, in the drill husbandry, as fully and as beneficially what would have required *sixteen* loads in the usual way of spreading it over the land.

Having thus described the various important circumstances connected with the collecting, preserving, and application of the manures, we shall conclude this branch of our subject with the Rev. Mr. Close's table for manuring land, which will enable the farmer at one inspection to calculate, with accuracy, the number of loads which it will be necessary to employ in manuring a field, per acre, at the distances therein specified.

Number of heaps to a load..	Number of Loads per Acre.							
	1	2	3	4	5	6	7	8
At five yards' distance.....	193	96	64	48	38	32	27	24
At five yards' and a half distance.	160	80	53	40	32	26	23	20
At six yards' distance.....	134	67	44	33	26	22	19	16
At six yards' and a half distance.	114	57	38	28	22	19	16	14
At seven yards' distance.....	98	49	32	24	19	16	14	12
At seven yards' and a half distance	86	43	28	21	17	14	12	10
At eight yards' distance.....	75	37	25	18	15	12	10	9

EXPLANATION OF THE FIRST TWO ROWS OF FIGURES IN THE PRECEDING TABLE.

The number of heaps, consisting of one load each, laid at five yards distant, is 193 to cover one acre; at *two* heaps to a load, 96; at *three* heaps, 64; at *four*, 48; and so to the end. Each of the following rows is to be read in a similar manner.

CHAPTER VIII.

ON THE FLEMISH SYSTEM OF MANURING.

THE deservedly high reputation which the Netherlands have long attained in agriculture, renders every part of their system of husbandry so peculiarly interesting, that no apology will be necessary for presenting another extract from Sir John Sinclair's

sketch of the agricultural state of that country already so often alluded to in the course of this work.

"The Flemish farmers are peculiarly distinguished by their great attention to manure. It is a principle with them, that the fertility of the soil entirely depends on the riches you give it, and that a farmer cannot be too attentive to the collection and application of this source of wealth. The more opulent farmers likewise pave, and line with bricks, the receptacles for their dung, which is thus kept constantly plunged in a mass of liquid matter. The fibrous parts of the vegetables are in this way completely decomposed, and four tons of this manure go as far as five collected and kept with less precaution *.

"The following is a list of the manures made use of in the neighbourhood of Lisle.

"1. The dung of cattle and horses, with the straw; 2. ashes; 3. lime; 4. the urine of animals, collected with care in brick cisterns; 5. the cakes of rape and hemp seed †, reduced to powder in a mill, and which is sometimes thrown into the urine cisterns. This last sort of manure, on account of its strength, is scattered about in small quantities, fifteen days before the seed is sown, that it may not prove injurious to the plant. 6. The sour water obtained by washing the tubs of starch-makers. This is considered to be a very weak manure. 7. The urine of cattle fattened at the distilleries; 8. the dung of pigeons; 9. that of sheep, gathered by young children along the sides of the roads; 10. street dung; 11. marle; 12. the refuse of horns, a manure as effectual the second as the first year; 13. night-soil purchased from scavengers. The price of this article is three-pence, to the scavengers, per ton, and twice as much to the inhabitants of the country. A waggon-load of this matter, drawn by three horses, costs only twelve francs, or 10*s*. sterling. The town of Lisle, however, alone produces as much of this sort of manure, as would sell for about 4200*l*. a-year. The night-soil of an hospital there, containing 1800 souls, is let for 3300 francs, or 137*l*. 10*s*. per annum.

"In order to increase the quantity of manure, not only horses, but cattle, and even sheep, are kept in stables during almost the whole year; and, that nothing may be lost, the stables and

* Communications to the Board of Agriculture, Vol. I. p. 238.

† Cakes of flax-seed are destined for feeding cattle and sheep

cow-houses are washed with water, which is conveyed into cisterns, or thrown into the dunghill.

"Great attention is also paid to cover the dung. When it is spread on the surface of a field to be ploughed, after a furrow is made, a person with a fork or rake goes before the plough, and throws from the surface, into the furrow, the manure upon as much soil as the plough is likely to turn over, which is thus effectually covered, and prevented from being exposed to the atmosphere. This should be done *in all cases*, and not restricted to the potatoe crop, as in this country.

"The Baron de Serret has ascertained, that powdered rape-cake, strewed over the surface of the ground, destroys la taupe grillon (gryllo talpa), so injurious to kitchen-gardens; and he is persuaded that every insect of the same species may be destroyed by the same means*.

"But the great improvement that has taken place, in regard to manure, is, its being applied in a liquid state. For that purpose, the urine of cattle and horses is regularly collected into cisterns, that none of it may be lost. Mr. Mondez has five cisterns at Frasnes, fit to contain 230 metres (about 250 English yards in capacity), for receiving the urine of 68 cattle, of different ages, and 82 horses, young and old. This quantity of urine manures 16 French hectares, or about 40 English acres. Many other farmers adopt the same system.

"It is proper to state, that several intelligent practical farmers object to this plan; alleging, that the dung of the farm-yard loses as much as is gained by the cistern system. But those who were appointed to examine Mr. Mondez's practice declare, that owing to the judicious concavity of the farm-yard, there was as much moisture as was necessary to ferment the straw, which may be effected by water alone, and repeated turnings, as gardeners know well; and it is now ascertained, by the experience of the Swiss, that liquid manure is the most efficacious of

* "The use of oil in vegetation also, is very great. When the cuttings of gooseberries are planted, it should be done in a lump of clay mixed with cow-dung, and a few drops of train oil; and when young thorns are planted in a poor or sandy soil, they will thrive better, if their roots are dipped in oil. Near the first turnpike going to Mile-End, there is an artificial manure sold, supposed to be the sweepings of the dry-salters in Thames-street, mixed with the refuse of those places where the blubber of whales is boiled; one bushel of which, it is said, is equal to twenty-eight of common manure."

any, and produces a third more effect than what is spread on the surface. Hence, after the dung is fermented, they dilute it in water, and the liquid alone is carried to the field, and scattered over it. The earth immediately imbibes the liquid, which soon reaches the roots of the plants, and causes a rapid vegetation; whereas it is a long time before dung in a solid state fertilizes the soil. The straw that remains after the dung is thus washed, is applied as manure for potatoes.

"The experience of Mr. Harley, who keeps a great dairy near Glasgow, corroborates this doctrine. He says, 'That the advantages of irrigating grass lands with cows' urine, almost exceeds belief. Last season some small fields were cut six times, averaging fifteen inches in length at each cutting, and the sward very thick. The soapsuds of a neighbouring wash-house are applied to the same purpose, with considerable advantage.'

"The great argument for separating the urine from the dung is, that it is always at the command of the farmer, and can be applied in any manner he thinks most advantageous. It is peculiarly useful in spring, when the application of liquid manure gives a new fillip to the plant, and makes its growth more vigorous. The urine is much improved by powdered rape-cakes, which are frequently thrown into the cisterns."

APPENDIX.

No. I.

SMITHFIELD CLUB CHRISTMAS SHOW, 1829,

IN THE REPOSITORY YARD IN GOSWELL STREET,

On FRIDAY the 11th, SATURDAY the 12th, and MONDAY the 14th DECEMBER.

The Right Hon. VISCOUNT ALTHORPE, *President.*
The Honourable Lord STRATHAVEN, M.P. Sir JOHN SAUNDERS SEBRIGHT, Bart. M.P.
CHARLES C. WESTERN, Esq. M.P. THOMAS MELLISH, Esq.
And JOHN MARTEN CRIPPS, Esq. *Vice-Presidents.*
Mr. JOHN BUCKLEY, Mr. JOHN BEASLEY, and Mr. SAMUEL BENNETT, *Stewards.*

PREMIUMS OFFERED FOR STOCK DULY QUALIFIED AND PROPERLY CERTIFIED,

According to the General and Particular Conditions below.

CLASS I. Oxen or Steers of any Breed, under 6 Years of Age, without Restrictions as to Feeding, yet *the kind* or *kinds* of Food must be certified.

To the Feeder of the best Fat Steer, a Premium, Plate or Money, 20 *Sovereigns.*

CLASS II. Oxen or Steers, of any Breed or Age, Weight 160 stone and upwards, that shall not have had Cake, Corn, Meal, or Seeds, previous to the 1st of August, 1829.

To the Feeder of the best fat Ox or Steer, 1st Premium, Plate or Money, 20 *Sovereigns.*

To the Feeder of the second best ditto, the 2d ditto, ditto, 10 *Sovereigns.*

CLASS III. Oxen or Steers, of any Breed or Age, under 160 stone and above 120 stone Weight, that shall not have had Cake, Corn, Meal, or Seeds, previous to the 1st of August, 1829.

To the Feeder of the best fat Ox or Steer, the 1st Premium, Plate or Money, 15 *Sovereigns.*

To the Feeder of the second best ditto, the 2d ditto, ditto, 10 *Sovereigns.*

CLASS IV. Oxen or Steers, of any Breed or Age, under 120 stone Weight, that shall not have had Cake, Corn, Meal, or Seeds, previous to the 1st of August, 1829.

To the Feeder of the best fat Ox or Steer, a Premium, Plate or Money, 10 *Sovereigns.*

CLASS V. Fattened Dairy Cows, that have calved twice at the least,

and once in each of the years 1827 and 1828, and that shall not have been dried the last time previous to Nov. 1, 1828.

To the Feeder of the best fat Cow, a Premium, Plate or Money, 15 *Sovereigns.*

CLASS VI. Cows or Heifers of any Age, that may not be eligible for the 5th Class. Freemartins and spayed Heifers are not qualified.

To the Feeder of the best fat Cow or Heifer, a Premium, Plate or Money, 10 *Sovereigns.*

CLASS VII. Long-woolled fat Wether Sheep, One Year old, that have never had Cake, Corn, Meal, Seeds, or Pulse.

To the Feeder of the best Pen of Three, under 22 Months old, the 1st Premium, Plate or Money, 10 *Sovereigns.*

To the Feeder of the 2d best ditto, ditto, ditto, 5 *Sovereigns.*

CLASS VIII. Long-Woolled fat Wether Sheep, Two Years old, that have never had Cake, Corn, Meal, Seeds, or Pulse.

To the Feeder of the best ditto, above 22 and under 34 Months old, a Premium, Plate or Money, 10 *Sovereigns.*

CLASS IX. Short-woolled fat Wether Sheep, One Year old, without restrictions as to feeding.

To the Feeder of the best Pen of Three, under 22 Months old, the 1st Premium, Plate or Money, 10 *Sovereigns.*

To the Feeder of the 2d best ditto, ditto, ditto, 5 *Sovereigns.*

CLASS X. Short-woolled fat Wether Sheep, Two Years old, without restrictions as to feeding.

To the Feeder of the best ditto, above 22 and under 34 Months old, a Premium, Plate or Money, 10 *Sovereigns.*

CLASS XI. Pigs, of any Breed.

To the Feeder of the best Pen of Three, above 4 and under 9 Months old, the 1st Premium, Plate or Money, 10 *Sovereigns.*

To the Feeder of the 2d best ditto, ditto, 5 *Sovereigns.*

GENERAL CONDITIONS, APPLICABLE TO ALL THE CLASSES.

(Weight 8 lbs. to the Stone, sinking the Offal.)

Dead weight returns of every animal exhibited for these premiums must be sent by the butcher who slaughters them, to the Secretary, as early as possible after the Show.

Each animal shewn must have been at least six months in the possession of the exhibitor.

The name, residence, and post-town of the feeder; the name of the breed; the number of the Class in which the animal is to be exhibited; the christian and surname, residence, and post-town of the breeder; the pedigrees of the animals exhibited, as far as they can be obtained (except that the breeder or the pedigree of Scotch, Welsh, or Irish cattle, is not indispensably required); their ages at the date of the Show; and the kinds of food upon which the animals have been fattened; must all be certified: and each certificate must be signed by the feeder, and dated a short time before the Show.

These certificates, filled up in, or copied exactly agreeable to, the printed forms, (on one side only of the paper, and if more certificates are written than one, it should be in such manner that they can be separated,) must be sent, by the post or otherwise, to Mr. William Farey, Secretary, No. 37, Howland Street, Fitzroy Square, so as to

reach him on or before Saturday evening, the 5th of December, otherwise the feeders of such animals will not be entitled to standing, straw, and hay, at the expense of the Club, during the Show; and the animals positively cannot be admitted into competition for the premiums.

No animal or pen shall gain more than one premium (sweepstakes excepted). Two beasts may be sent, in either of the Classes, but before one o'clock on Wednesday, the 9th of December, the owner, or some one for him, must select which of them shall stand in the competition, and which for each premium, in case of there being two in the class. Only one pen of three sheep, or three pigs, belonging to the same person, can be allowed to enter the Show Yard, unless certified to be exhibited for separate premiums, or as extra stock, properly described as to the age, breed, breeders' and feeders' names, residences, feeding, &c. Every animal sent, whether for a premium or as extra stock, must have been previously so described to the Secretary, in order that labels may be prepared for every animal or pen, and a gate-list of all such animals sent to the yard on the morning of the 9th. All other stock will be refused admission.

That no beast, sheep, or pig once exhibited here for a premium be again permitted to enter the yard, at any future Show, except as extra stock; and the paper sent to the Secretary must mention such previous exhibition here or elsewhere. No bull, nor any boar, above twelve months old, can be permitted to enter the yard.

All animals intended to be exhibited at the Show for a premium must arrive at the yard before one o'clock on Wednesday afternoon, the 9th of December, and none can be admitted after that time; and that no extra stock be admitted into the yard during the time the stewards are classing and arranging the stock, or the judges deciding the premiums; and that each candidate, or some one on his behalf, must be in attendance at the yard until the evening, in order to answer any questions, as to the animals or certificates, which the stewards or judges may require while classing the animals.

That no person formerly a member, but withdrawn, whilst standing indebted to the Club, be permitted to shew stock or other things.

Particular Conditions, in addition to the General ones above.

Oxen.—That the age, in years and months, of each ox or steer; the distance each has travelled, on foot or in caravan, from the place of feeding to the Show, and if partly by canal-boat, it should be mentioned how far; also, in the case of those oxen or steers that have been fed on corn, meal, cake, or seeds, that no corn, meal, cake, or seeds were given to them previous to the 1st of August, 1829; and the kind and quantity of corn or meal, and the weight in pounds (and not the number) of oil cake or of oily seeds they have consumed, must all be certified.

Cows.—The cows exhibited in Class V. must be certified to have calved at their full time, twice at least (independent of twins), and to have last calved within the years 1827 or 1828; the whole number of

times of calving: and in Class VI. the fact of the cows being ineligible in the preceding class, and the cause thereof, and the time of their being put to fatten must be certified. In both these Classes, the ages of the cows, the breeders' names, residences, and post-towns, and the distances the cows have travelled on foot (or in a caravan or boat) from the place of feeding to the Show, must all be certified. There is no restriction as to feeding in either of these classes, but the kind or kinds of food on which the cows have been fed must be mentioned in the certificate.

SHEEP.—The three sheep in each pen must all have been lambed in the same year, and bred by the same person; and that the long-woolled sheep have never eaten cake, seeds, corn, pulse, or meal of these, must all be certified. They must be shewn in their wool, until after the judges' award is made.

PIGS.—That each pen of pigs exhibited are all of the same litter, and the kind of food upon which they have been fed for the last three months previous to the Show must all be certified. The quantities also of food would be desirable.

INSTRUCTIONS TO THE JUDGES.

The judges (without knowing any names of parties or places until after their decision) are to determine and adjudge (by the numbers previously affixed up by the stewards in a regular series) for the best fat stock, having regard in forming their judgement to quality of flesh, lightness of offals, age, feeding, and to early maturity in sheep and pigs, and also in oxen, if not worked; and in dairy cows, to the age and number of calves; but the judges are requested to observe that in the Classes I. V. VI. IX. and X. the prizes are offered without restrictions as to feeding, yet to keep strictly in view the object for which the Smithfield Club was originally instituted, viz. "The supplying of the cattle markets of Smithfield and other places with the cheapest and best meat."

The feeder's certificate of age and feeding to be evidence to the judges, if not contradicted by counter evidence; in which event, the stewards and judges will determine on the case from the circumstances of it, without reference to any other persons. When the judges shall have reasonable doubts as to the weight of any ox or steer, which they may deem to be worthy of the premium intended for such an ox or steer, he shall not, on account of weight, be excluded, provided, in the opinion of the judges, he does not vary from the limited weight by more than one-twelfth part thereof.

They are not to adjudge any premium unless they shall deem the animal or animals exhibited for such premium to have sufficient merit, especially where there is no competition. And the judges are to be allowed the whole of Thursday, without the admission of strangers, for making their adjudication, and signing their award.

A List of the Prizes awarded by the Smithfield Club, 1829.

Judges:—Mr. Thomas Chapman, Stoneley, near Coventry. Mr. C. Stokes, Kingston, near Kegworth, Leicestershire.
Mr. Thomas Edward Paulett, Stamford, Lincolnshire.

OXEN.

Class I.—A premium of 20 sovereigns to Mr. W. Smith, of Dishley, near Loughborough, Leicestershire, for his 3 years and 10 months old short-horned Steer, bred by him and fed on grass, Swedish turnips, green vetches and cabbages, with 8 bushels of bean meal and 350 lbs. of oil cake; travelled in boat 111 miles to the Show.

Class II. The 1st premium of 20 sovereigns to the right hon. Lord Viscount Althorp, for his 5 years and 1 month old Durham Ox, bred and fed by his Lordship, at his farm at Chapel Brampton, near Northampton, on grass, mangel wurzel, cabbage, Swede turnips, and 1148 lbs. of oil cake; travelled on foot 5 and in boat 97 miles to the show. His Lordship's Ox also gained the sweepstakes.

The 2d premium of 10 sovereigns to Mr. Richard Rowland, of Cresslow, near Aylesbury, Bucks, for his 5 years old Hereford Ox, bred by Mr. John Jones of Lower Brainton, near Hereford, fed on grass, hay, and 2000 lbs. of oil cake; travelled on foot 7 and in boat 40 miles to the Show.

Class III. The 1st premium of 15 sovereigns to Mr. Richard Kitelee, of Castlethorpe, Bucks. for his 5 years old Hereford Ox, bred by Mr. Bennet, of Inskip, near Ross, Hereford, fed on grass, hay, turnips, and 900 lbs. of oil cake; travelled in boat 70 miles to the Show.

The 2d premium of 10 sovereigns to Clark Hillyard, Esq., of Thorplands, near Northampton, for his 6 years old Hereford Ox, bred by Mr. Lea, of Holstry, near Hereford, fed on grass, hay, Swedish turnips, 250 lbs. of oil cake, and 950 lbs. of barley meal; travelled on foot 4 and in boat 66 miles to the Show.

Class IV.—A premium of 10 sovereigns to Mr. Richard Kitelee, of Castlethorpe, Bucks. for his 4 years and 6 months old Hereford Ox, bred by Mr. Clark, of Loyd near Hereford, fed on grass, hay, turnips, and 800 lbs. of oil cake; travelled by boat 70 miles to the Show.

COWS.

Class V.—A premium of 15 sovereigns to Mr. Richard Kitelee, of Castlethorpe, Bucks. for his 5 years old Hereford Cow, bred by W. Rayer, Esq., of Longdon, near Upton on Severn, Worcestershire, fed on grass, hay, turnips, and 800 lbs. of oil cake; travelled 70 miles in boat to the Show.

Class VI.—A premium of 10 sovereigns to Sir Charles Knightley, Bart., of Fawsley Park, near Daventry, Northamptonshire, for his 9 years old Durham Cow, bred by Colonel Cradock, of Hartforth, near Richmond, Yorkshire, put to fatten the 20th October, 1828, fed on hay, a small quantity of barley flour, and 956 lbs. of oil cake; travelled 8 miles on foot and 95 miles in boat to the Show. Not having had a calf since December, 1827, this Cow was ineligible for Class V.

SHEEP.

Class VII.—The 1st premium of 10 sovereigns to the Right Hon. Earl Brownlow, of Belton, near Grantham, Lincolnshire, for his three 21 months old Leicester Wethers, bred by his Lordship, and fed on cole, carrots, and Swede turnips.

The 2d premium of 5 sovereigns to Mr. Richard Kitelee, of Castlethorpe, Bucks. for his three under 22 months old Cotswold and Leicester Wethers, bred and fed by him on grass, hay, turnips, and cabbage.

Class VIII.—A premium of 10 sovereigns to the Marquess of Exeter, for his three 32 months old Leicester Wethers, bred by his Lordship at Burghley, and fed on vegetables only.

Class IX.—The 1st premium of 10 sovereigns to Mr. Stephen Grantham, of Stoneham, near Lewes, Sussex, for his three 20 months old South Down Wethers, bred and fed by himself.

The 2d premium of 5 sovereigns to his Grace the Duke of Richmond, for his three 20 months old South Down Wethers, bred and fed by his Grace at Goodwood, near Chichester.

Class X.—A premium of 10 sovereigns to Mr. S. Grantham, of Stoneham, near Lewes, Sussex, for his three 32 months old South Down Wethers, bred and fed by himself.

PIGS.

Class XI.—The 1st premium of 10 sovereigns to Mr. William Orchard, of Hornsey, Middlesex, for his three 31 weeks old Essex and Hertfordshire Pigs, bred and fed by himself on barley meal, milk, wash, and water.

The 2d premium of 5 sovereigns to Mr. John Dodd, of Chenies, Bucks, for his three 32 weeks old Pigs, bred by Mr. George Dodd, of Chenies, fed on barley meal only.

A Brief Account of the SMITHFIELD CLUB'S PREMIUMS, offered and awarded in 1828; of the STOCK which gained the PREMIUMS, and of the others which competed with them; on the 13th, 14th, and 16th December 1828.

CLASS I.—For Oxen or Steers of any breed, under 6 years of age, without restrictions as to feeding.

To James Senior, Esq., of Broughton Hall, Aylesbury, a premium of 20 sovereigns for his 5 years and 6 months old Hereford Ox, bred by W. C. Hayton, Esq., of Moreton Court, Hereford, fed on grass, hay, and 500 lb. of oil cake.—Dead weight 218 st. 4 lb.

The other competitors: Mr. Joseph Kitelee, a 4 years and 11 months old Hereford Ox, bred by Mr. William Meats, near Hereford, cake fed.—Felix Booth, Esq., a 4 years and 10 months old short-horned Ox, bred by himself, fed on grains and wash, and clover chaff.

CLASS II.—For Oxen or Steers of any breed or age, weight 180 stone and upwards.

To James Senior, Esq., the 1st premium of 20 sovereigns, for his 5 years and 6 months old Hereford Ox, bred by Wm. C. Hayton, Esq., fed on grass, hay, and since 1st Oct. 500 lbs. of oil cake.—Dead weight 204 st. 6 lb.

To the Right Hon. Lord Viscount Althorp, the 2d premium of 10 sovereigns, for his 4 years and 2 months old Durham Ox, bred by his Lordship, near Northampton, fed on grass, hay, lucerne, Swedish turnips, mangel wurzel, and 1,890 lb. of oil cake.—Dead weight 210 st. 4 lb. and 30 st. fat.

The other competitors: Mr. Richard Kitelee, a 5 years and 2 months old Hereford Ox, bred by Mr. William Rayer, cake fed; dead weight 213 st., and 22 st. of fat.—Mr. Joseph Kitelee, a 5 years and 6 months old Hereford Ox, bred by W. C. Hayton, Esq., cake fed.—Mr. Charles Stokes, a 5 years and 7 months old improved short-horned Ox, bred by himself, cake fed.—Mr. Thomas Oldacres, a 4 years and 9 months old Hereford Ox, bred by John Arkwright, Esq., Herefordshire, cake fed; the Judges particularly commended this Ox, and generally commended all in this class.

CLASS III.—For Oxen or Steers of any breed or age, under 180 stone, and above 120 stone weight.

To Mr. Richard Kitelee, of Castlethorpe, Bucks, the 1st premium of 15 sovereigns, for his 5 years and 6 months old Hereford Ox, bred by W. C Hayton, Esq., fed on grass, hay, turnips, and 1,200 lb. of oil cake.—Dead weight 184 st. 2 lb., and 20 st. 5 lb. fat.

To Mr. Joseph Kitelee, of Castlethorpe, Bucks, the 2d premium of 10 sovereigns, for his 4 years and 11 months old Hereford Ox, bred by Mr. William Meets, near Hereford, fed on grass, hay, turnips, and 900 lb. of oil cake.

The other competitors: Mr. Robert Masters, a 4 years and 6 months old Hereford Ox, bred by Mr. John Gibbons, of Northamptonshire, cake fed.—Mr. William Goodale, a 4 years and 5 months old Durham Ox, bred by Isaac Pears, of Northamptonshire, cake fed.—James Trevor Senior, Esq., a 3 years and 4 months old Hereford Ox, bred by W. C. Hayton, Esq., of Hereford, cake fed; dead weight 182 st.—Mr. Thomas Oldacres, a 4 years and 8 months old Hereford Ox, bred by John Arkwright, Esq., of Herefordshire, cake fed.

CLASS IV.—For Oxen or Steers of any breed or age, under 120 stone weight.

To Mr. Richard Kitelee, of Castlethorpe, a premium of 10 sovereigns, for his under 5 years old Scotch Ox, fed on grass, hay, turnips, and 800 lb. of oil cake.

The other competitors: Mr. Rd. Hewitt, a Hereford Ox; oil-cake fed; the Judges commended this Ox.—Clark Hillyard, Esq., a 4 years and 7 months old Hereford Ox, bred by the Rev. Mr. Smithies, of Herefordshire, cake fed; the Judges commended this Ox.—John G. Booth, Esq., an under 5 years old Scotch Ox, grains fed.—Mr. Joseph Kitelee, about 3 years old Hereford Steer, cake fed.—Sir George Crewe, Bart., a past 4 years old Scotch Ox, cake fed; dead weight 107 st. 6 lb.

CLASS V.—For fattened Dairy Cows, that have calved twice at the least.

To William Phillip Honeywood, Esq., M.P., of Essex, a premium of 15 sovereigns, for his 4 years and 11 months old Sussex Cow, bred by himself, fed on hay, mangel wurzel, and cake; has calved twice, the last on the 5th April, 1827, and dried in August.

The other competitors: the Marquis of Exeter, a 10 years and 6 months old Durham Cow, bred by Mr. John Grant, of Lincolnshire, vegetable fed; dead weight 140 st. 8 lb., and 26 st. fat; the Judges commended her great merit.—His Grace the Duke of Rutland, a 7 years and 10 months old Durham and long-horned Cow, bred by his Grace, cake fed.—Pindar Simpson, Esq., a 5 years and 1 month old Yorkshire Cow, bred by Mr. George Bott, of Durham, cake fed; dead weight 154 st. 6 lb. and 23 st. of fat.—Mr. George Dodd, of Chenies, Bucks, a 5 years and 8 months old Durham and York Cow, bred by himself, cake fed.—Mr. Richard Kitelee, a 6 years and 8 months old Hereford Cow, bred by Mr. Rayer, of Worcestershire, cake fed.—Mr. Robert Edmonds, a 5 years and 9 months old improved short-horned Cow, cake fed; dead weight 160 st., and 21 st. of fat.—Mr. John Warmington, a 6 years old Scotch Ayrshire Cow, cake fed.

Class VI.—For Cows or Heifers of any age, that may not be eligible for the 5th Class, Freemartins and spayed Heifers not qualified.

To Charles Tibbetts, Esq., of Barton Seagrave, Northamptonshire, a premium of 10 sovereigns, for his 6 years and 7 months old Durham short-horned Steer, bred by himself, fed on grass, Swedish turnips, mangel wurzel, oil cake, and barley meal; has not had a calf since July, 1826.

The other competitor, the Marquis of Exeter, a 4 years and 9 months old Durham Cow, bred by his Lordship, fed on vegetables only.

Class VII.—For long-woolled fat Wether Sheep, under 22 months old, that have had no corn.

To the Right Hon. Lord Viscount Althorp, the 1st premium of 10 sovereigns, for his three 21 months old Leicester Wethers, bred by his Lordship, near Northampton, fed on grass, hay, mangel wurzel, and Swede turnips.

To his Grace the Duke of Rutland, the 2d premium of 5 sovereigns, for his three 22 months old Leicester Wethers, bred by his Grace, at Belvoir, fed on grass, Swede turnips, carrots, and mangel wurzel.—Dead weights of each, 18 st. 6 lb.; 19 st. 4 lb.; 18 st. 7 lb.

The other competitors: Mr. Bull, three 21 months old Leicesters, bred by himself.—Mr Humphry Tuckwell, three 20 months old Coltswold and Leicesters, bred by himself.

Class VIII.—For long-woolled Wethers, above 22 and under 34 months old, that have had no corn.

To Mr. Henry Chamberlain, of Desford, near Leicester, a premium of 10 sovereigns for his three 32 months old Leicesters, bred by himself, fed on grass, cabbage, and turnips.—Dead weights of each, 21 st. 5 lb.; 20 st. 6 lb.; 21 st. 7 lb.

The other competitors: Mr. Joseph Bull, three 33 months old Leicester Wethers, bred by himself.—Dead weights of two, 21 st. 1 lb; 18 st. 3 lb.—Mr. Humphry Tuckwell, three 32 months old Cotswold and Leicesters, bred by himself.—Mr. Thomas Sutton, three 32 months old long-woolled Wethers, bred by himself.—Mr. Henry Haynes, three 32 months old Leicesters, bred by Mr. Lancelot, near Oundle.—Dead weight of each, 21 st. 2 lb.; 22 st. 3 lb.; 20 st. 1 lb.—Mr. Richard Kitelee, three 32 months old Coltswold Wethers, bred by Mr. William Halls, near Cirencester.

Class IX.—For short-woolled Wether Sheep, under 22 months old, any how fed.

To John Ellman, Esq., of Glynde, near Lewes, the 1st premium of 10 sovereigns, for his three 20 months old South Down Wethers, bred by himself.—Dead weight of one, 14 st. 7 lb.

To Sir Thomas Dyke, Bart., of Lullingstone, near Dartford, Kent, the 2d premium of 5 sovereigns, for his three 20 months old South Downs, bred by himself.

The other competitors: Lord Viscount Gage, three 20 months old South Downs, bred by himself.—Dead weights of each, 15 st. 5 lb.; 13 st. 4 lb.; 12 st. 3 lb.—Mr. Drewitt, three 20 months old South Downs, bred by Lord King.—Mr. Henry Boys, three 20 months old South Downs, bred by himself.—Dead weights of each, 14 st. 7 lb.; 14 st. 7 lb.; 14 st. 5 lb.

Class X.—For short-woolled Wethers, above 22 and under 34 months old, any how fed.

To Mr. Stephen Grantham, of Stoneham, near Lewes, a premium of 10 sovereigns, for his three 32 months old South Downs, bred by himself.—Dead weight of one, 18 st.

The other competitors: the Duke of Richmond, three 32 months old South Downs, bred by his Grace.—Dead weight of two, 17 st.; 14 st. 7 lb. Mr. Henry Boys, three 32 months old South Downs, bred by John Ellman, Esq.; the Judges

highly commended them. — Lord Visct. Gage, three 32 months old South Downs, bred by himself.—Dead weights of each, 17 st. 5 lb.; 19 st.; 14 st. 7 lb.

The Judges stated that the shew of South Down Wethers generally possess great merit.

Class XI.—For Pigs of any breed, above 4 and under 9 months old.

To Mr. William Orchard, of Hornsey, Middlesex, the 1st premium of 10 sovereigns, for his three 35 weeks and 3 days old Essex and Hertfordshire Pigs, bred by himself, fed on grains, middlings and water, barley meal, and milk.

To Charles Nicholas Pallmer, Esq., M.P., of Norbiton, near Kingston, Surrey, the 2d premium of 5 sovereigns, for his three 34 weeks old Norfolk and Suffolk Pigs, bred and fed by him on barley meal and milk.—Dead weight of each, 45 st.; 40 st. 6 lb.; 40 st. 2 lb.

A Brief Account of the Smithfield Club's Premiums, offered and awarded in 1827; of the Stock which gained the Premiums, and of the others which competed with them; and of some of the Extra Stock exhibited, on the 14th, 15th, and 17th December.

Class I.—For fat Oxen or Steers of any Breed, without restrictions as to feeding.

To the feeder of the best Ox in this class, Mr. Wm. Goodman, near Wisbech, Cambridgeshire, a premium of 20 gs. for his 6 years and 5 months old improved short-horned white Ox, bred by himself, fed on grass, hay, oil cake, and bean meal; and in the last two months a little oil with his hay, and a few potatoes and cabbage.

The other competitors were, John Booth, Esq., of Hornsey, Middlesex, a 3 years and 10 months old Hereford Steer, bred by Miss Southall, of Torrington, Herefordshire, fed on grains, chaff, and distiller's wash *.—Wm. Smith, Esq., a 4 years and 10 months old improved short-horned Ox, cake fed.—Mr. Richard Rowland, a 5 years old Hereford Ox, cake fed.—Mr. Richard Kitelee, a 5 years old Hereford, cake fed.

Class II.—For Oxen or Steers of any breed or age, weight 180 stone and upwards.

To the feeder of the best Ox in this class, Mr. Richard Kitelee, of Castlethorpe, a premium of 20 gs. for his 5 years old Hereford Ox, bred by Mr. W. Rayer, of Longden, Worcestershire; fed by Mr. K. on grass, hay, and turnips, and since 14th Sept. last, 1,500 lb. of oil cake.

To the feeder of the 2d best Ox in this class, Lord Viscount Althorp, a premium of 10 gs. for his 4 years and 8 months old Hereford and Durham Ox, bred by H. Vansittart, Esq., of Kirk Catham, near Guisborough, York, fed by his Lordship on lucerne, hay, Swedish turnips, mangel wurzel, and 755 lb. of oil cake.

The other competitors: Mr. Richard Rowland, a 5 years old Hereford Ox, cake fed.—Mr. Daniel Trinder, a 4 years and 10 months old mixed Hereford and Durham Ox, cake fed.—Charles N. Pallmer, Esq. M.P., a 4 years and 7 months old Durham Ox, cake fed.—Mr. Wm. Smith, a 3 years and 8 months old short-horned Ox, cake fed.—Mr. Luke Uppoton, a 6 years and 10 months old Sussex Ox, grass and potatoe fed.

* This Ox was entered by mistake as being not more than 2 years and 10 months old, and the Judges adverting to this statement of his age, in the first instance, adjudged him to be the best in this class.

Class III.—For Oxen or Steers of any breed or age, under 180 stone, and above 120 stone weight.

To the feeder of the best Ox in this class, Mr. Richard Kitelee, of Castlethorpe, a premium of 15 gs. for his under 5 years old Hereford Ox, bred by the Rev. Mr. Smithies, near Hereford, fed by Mr. K. on grass, hay, turnips, and 1,500 lb. of oil cake, since 14th Sept. last.

To the feeder of the 2d best Ox in this class, Mr. Joseph Kitelee, of Castlethorpe, a premium of 10 gs. for his 4 years old Hereford Ox, bred by Mr. Meets, near Hereford, fed by Mr. K. on grass, hay, and 820 lb. of oil cake.

The other competitors: Mr. Richard Hudson, a 4 years old Aberdeen Ox, cake fed; the Judges highly commended this animal for its fastness and perfection of fatting.—Mr. James Senior, a 3 years and 10 months old Hereford Ox, cake fed.—Mr. James Trevor Senior, a 4 years old Hereford Ox, cake fed.

Class IV.—For Oxen or Steers of any breed or age, under 120 stone weight.

To the feeder of the best Ox in this class

Mr. Joseph Kitelee, of Castlethorpe, a premium of 10 gs. for his 4 years and 6 months old Scotch Ox, fed on grass, hay, and 300 lb. of oil cake.

The other competitors: Mr. Richard Hudson, a 4 years old Aberdeen Ox, cake fed; the Judges highly commended on account of his fastness of fatting.—Mr. Richard Kitelee, a 4 years old Hereford Ox, cake fed.

Class V.—For fattened Dairy Cows, that have calved twice at the least.

There were none shewn.

Class VI.—For fat Cows or Heifers of any age, that may not be eligible for the 5th Class; Freemartins, and spayed heifers not qualified.

To the feeder of the best Cow in this class, Mr. Wm. Goodale, of Market Deeping, near Stamford, Lincolnshire, a premium of 10 gs. for his 6 years and 5 months old Durham Cow, bred by Mr. Isaac Peers, of Thorney, near Peterborough, fed by Mr. G. on grass, hay, cole seed, 8 bushels linseed, and 200 lbs. of oil cake.

The other competitors: Mr. Joseph Bull, a 4 years and 8 months old Hereford Cow, bred by Mr. John Price, of Ryal, Worcestershire, fed by Mr. B. on grass, hay, 8 bushels linseed, and 18 bushels of barley meal; the Judges highly commended her.—Sir J. H. Palmer, Bart., a 7 years and 2 months old short-horned Cow, cake and bean-flour fed.—The Marquis of Exeter a 4 years and 1 month old Durham Cow, bred on his Lordship's Burghley Farm, fed by Mr. J. Noon.

Class VII.—For fat long-woolled Wethers under 22 months old that have never had corn.

Mr. Henry Chamberlain shewed three 20 months old New Leicester Wethers, bred by himself, fed on cabbage and turnips, but the Judges did not deem them of sufficient merit, there being no competition.

Class VIII.—For fat long-woolled Wethers above 22 months, and under 34 months old, that have never had corn.

To the feeder of the best pen of three in this class, Mr. Henry Chamberlain, of Desford, near Leicester, a premium of 10 gs. for his three 32 months old New Leicesters, bred and fed by himself on grass, cabbage, and turnips.

The other competitors: the Marquis of Exeter, three 32 months old Leicesters, the Judges highly commended them.—Mr. Humphrey Tuckwell, three 32 months old Coltswold and Leicesters.—The Judges also highly commended Mr. Robert Master's three 32 months old Leicesters.—And Mr. Joseph Bull's three 33 months old Leicesters.

Class IX.—For fat short-woolled Wethers under 22 months old, any how fed.

To the feeder of the best pen of three in this class, Lord Viscount Gage, a premium of 10 gs. for his three 20 months old South Down Wethers; bred on his Lordship's farm, at West Firle, fed by Mr. Richards.

To the feeder of the 2d best pen of three in this class, Sir Thomas Dyke, Bart., of Lullingstone, Kent, a premium of 5 gs. for his three 20 months old South Down Wethers; bred by himself.

The other competitors: Sir George Crewe, Bart., three 21 months old South Downs.—Mr. Henry Boys, three 20 months old South Downs.—And Mr. Thomas Smith, three 21 months old South Down Wethers.

Class X.—For fat short-woolled Wethers, above 22, and under 34 months old, any how fed.

To the feeder of the best pen of three, Mr. Stephen Grantham, of Stoneham, Sussex, a premium of 10 gs. for his three 32 months old South Downs, bred by himself.

The other competitors: Mr. Henry Boys, three 32 months old South Downs, which the Judges highly commended.—Sir George Crewe, Bart., three 33 months old South Downs.—And Thos. William Coke, Esq., M.P. three 32 months old South Downs.

Class XI.—For fat Pigs of any breed, above 4 and under 9 months old.

To the feeder of the best three pigs, Mr. Wm. Orchard, of Hornsey, Middlesex, a premium of 10 gs. for his three 34 weeks and 6 days old Essex and Hertfordshire Pigs, bred by himself from a boar of Mr. G. Dodds, of Chenies, and fed on grains, water, and damaged flour, and from 16th August to 13th Sept. last, on barley meal, potatoes and water, and latterly on barley meal and milk.

To the feeder of the 2d best three in this class, Messrs. Wm. and John Hayward, of Watlington, Oxfordshire, a premium of 5

gs. for their three 35 weeks old Berkshire Pigs; bred and fed by them on barley meal.

The other competitors: Mr. Henry St. John, three 33 weeks and 4 days old, Essex and Hertfordshire Pigs; the Judges highly commended them.—Charles N. Pallmer, Esq., M.P. three 36 weeks old Norfolk and Suffolk Pigs.—Mr. L. Guerrier, three 27 weeks old Essex Pigs.—Mr. Robert Walters, three 29 weeks old Suffolk Pigs.—Mr. Wm. Sheppard, three 18 weeks old Hertford and Essex Pigs.—And C. T. Towers, Esq., three under 32 weeks old Neapolitan and Essex Pigs.

EXTRA STOCK.

Oxen.—John Booth, Esq., two 4 years old Herefords.—Mr. Wood, an Ox, which the Judges commended.—Mr. Richard Hudson, two 4 years old Aberdeen Oxen.—Lord Althorp, a 4½ years old Durham Heifer.—Mr. L. Upperton, a 6 years and 9 months old Sussex Ox.—Mr. Jos. Bull, two 4 years and 8 months old Hereford Steers, which the Judges commended.—Mr. Wm. Guerrier, a 1 year and 9 months old half Alderney heifer, which the Judges deemed of great merit, for so much perfection, at so early an age.

Sheep.—Mr. Huckabody, a 3 year and 10 months Leicester Wether, fed on vegetables only, the Judges commended.—Mr. H. Chamberlain, two 32 months old Leicesters, the Judges strongly commended.—Sir Thomas Dyke, Bart., three 20 months old South Downs, the Judges commended.—The Marquis of Exeter, three 32 months old Leicesters.

Pigs.—Mr. Wm. Sheppard, a Sow, and one Hertford and Essex Pig.—And Mr. G. Dodds, two young Sows and a Barrow Pig, the Judges deemed deserving of great praise.—And Sir W. Lubbock, Bart., three Pigs.

A Brief Account of the Smithfield Club's Premiums, offered and awarded in 1826; of the Stock which gained the Premiums, and of the others which competed with them; and of some of the Extra Stock exhibited, on the 15th, 16th, and 18th December.

Class I.—For fat Steers of any breed, under 36 months old, without restrictions as to feeding.

To the feeder of the best Steer in this class, the Marquis of Exeter, of Burghley Park, a premium of 20 gs. for his Durham Steer, 2 years old, bred by his Lordship, and fed on cake, turnips, and bean meal.

No competition in this class.

Class II.—For fat Oxen or Steers of any breed or age, weight 160 stone and upwards.

To the feeder of the best Ox in this class, Mr. Richard Kitelee, of Castlethorpe, a premium of 20 gs. for his 5 year old Hereford Ox, bred by Mr. W. Rayer, of Longden, Worcestershire; fed by Mr. K. on grass, hay, turnips, 48 lb. of oil cake, and 4 bushels of beans.

To the feeder of the 2d best Ox in this class, Mr. William Smith, of Dishley, near Loughborough, Leicestershire, a premium of 10 gs. for his 3 year and 11 months old improved short-horned Ox, bred by Mr. S. on grass, turnips, green vetches, and 1,280 lb. of oil cake, and 16 bushels of barley meal.

The Judges declared that the Hon. B. Simpson's Durham Ox would have taken the prize, had it not been disqualified by a deficiency in the certificate.

The other competitors: the Hon. B. Simpson, a 5 year and 10 months old Durham Ox; cake fed.—Sir John Henry Palmer, Bart., a 5 year and 1 month old Durham Ox; grass fed.—Mr. Thomas Knight, a 5 year and 2 months old Durham Ox; cake fed.—Mr. Charles Stokes, a 5 year and 6 months old short-horned Ox; cake fed.—Mr. Daniel Trinder, a 6 year and 10 months old Durham and Hereford Ox; cake fed.

Class III.—For fat Oxen or Steers of any breed or age, under 160 stone, and above 110 stone weight.

To the feeder of the best Ox in this class, Mr. Richard Kitelee, of Castlethorpe, a premium of 15 gs. for his 4 year old Hereford Ox, bred by Mr. W. Rayer, of Longden, Worcestershire; fed on grass, hay, turnips, and 1,200 lb. of oil cake.

To the feeder of the 2d best in this class, Mr. Joseph Kitelee, of Castlethorpe, a premium of 10 gs. for his 3 year and 6 months old Hereford Ox, bred by Mr. White, of Upper Seyton, near Tewkesbury, Gloucestershire; fed on grass, hay, and 480 lb. of oil cake.

The other competitors: the Marquis of Exeter, a 4 year and 1 month old Durham

Ox; cake fed.—Mr. George Horn, a 5 year and 7 months old Hereford Ox; cake fed.—Mr. D. Trinder, a 4 year and 9 months old Durham and Hereford Ox; cake fed.

Class IV.—For fat Oxen or Steers of any breed or age, under 110 stone weight.

To the feeder of the best Ox in this class, Mr. Robert Masters, of Nethercote, a premium of 10 gs. for his 4 year old Scotch Ox, bred by Mr. M.; fed on grass, hay, and 900 lb. of oil cake.

The other competitors: Mr. J. Goodman, a 3 year and 5 months old Scotch Ox; cake fed.—Mr. Richard Kitelee, a 5 year old Scotch Ox; cake fed.

Class V.—For fattened Dairy Cows, that have calved twice at the least.

To the feeder of the best Cow in this class, Mr. William Adams, of Towcester, a premium of 15 gs. for his 7 year and 6 months old half Hereford Cow, bred by Mr. Wm. Gibbons, of Adston; fed on grass, hay, barley meal, and 570 lb. of oil cake.

The other competitors: the Marquis of Exeter, a 5 year and 2 months old Durham Cow.—Mr. L. Guerrier, a 4 year and 6 months old Durham Cow.—And Mr. Samuel Sandon, a 6 year old short-horned Cow.

Class VI.—For fat Cows or Heifers (not spayed) of any description or age, which may not be eligible for the 5th Class.

To the feeder of the best Cow in this class, Mr. Samuel Dyer, of Kirby, a premium of 10 gs. for his 5 year and 9 months old long-horned Cow, bred by Mr. D.; fed on grass and hay.

The other competitor: Mr. Wm. Adams, a 5 year old half short-horned and Hereford Cow, cake fed The Judges deemed this Cow worthy of very great merit.

Class VII.—For fat long-woolled Wether Sheep, under 22 months old.

To the feeder of the best pen of three in this class, Mr. Thomas Edward Pawlett, of Beeston, a premium of 10 gs. for his three 20½ months old new Leicester Wethers, bred by Mr. P.; fed on clover, hay, turnips, and carrots.

To the feeder of the 2d best pen of three in this class, his Grace the Duke of Rutland, a premium of 5 gs. for his three 21 months old Leicester Wethers, bred on his Grace's Belvoir Castle farm; fed on grass, carrots, Swedish turnips, and cole.

The other Competitors. Mr. Marshall Goude, three 20 months old new Leicesters.—Mr. Robert Masters, three 21 months new Leicesters.—Mr. Thomas Moore, three 21 months old Leicesters: the Judges bestowed high commendations on Mr. M.'s Sheep.—Mr. Richard Redgrave, three 21 months old Leicesters: the Judges also noticed the considerable merit of two of Mr. R.'s.—Sir Humphrey Tuckwell, three 21 months old Cotswolds and Leicesters.—And Mr. Richard Garratt, three 22 months old Leicesters.

Class VIII.—For fat long-woolled Wether Sheep, above 22 months, and under 34 months old.

To the feeder of the best pen of three in this class, the Marquis of Exeter, a premium of 10 gs. for his three 32 months old Leicester Wethers, bred on his Lordship's Burghley farm; fed on roots and cole.

The other competitors: Mr. Joseph Bull, three 32 months old Leicesters.—Mr. Marshall Goude, three 32 months old Leicesters.—Mr. Wm. Hewer, three 32 months old Coltswolds and Leicesters.—Mr. John Sammons, three 32 months old Leicesters.—Mr. D. Trinder, three 32 months old Leicesters.—And Mr. Humphrey Tuckwell, three 33 months old Cotswold and Leicesters.

Class IX.—For fat short-woolled Wether Sheep, under 22 months old.

To the feeder of the best pen of three in this class, Mr. John Ellman, of Glynde, a premium of 10 gs. for his three 20 months old South Down Wethers; bred by him, and fed on grass, hay, turnips, and 21 lb. of cake, one bushel and 4½ gallons of grey peas.

To the feeder of the 2d best pen of three in this class, Sir Thomas Dyke, Bart., a premium of 5 gs. for his three 20 months old South Down Wethers; bred by Sir Thomas, at Lullingstone, and fed on grass, turnips, hay, 1½ bushel of oats, 1 bushel 2 gallons of beans, and 35 oil cakes each.

The other competitors: Lord Viscount Gage, three 20 months old South Down Wethers.—And Wm. P. Honeywood, Esq., M.P. three 20 months old South Downs.

Class X.—For fat short-woolled Wether Sheep, above 22, and under 34 months old.

To the feeder of the best pen of three, Mr. Stephen Grantham, of Stoneham, a premium of 10 gs. for his three 32 months

old South Downs; bred by Mr. G.; fed on grass, hay, turnips, and 1 pint per day of mixed peas and oats.

The other competitors: Mr. Wm. Saxby, three 33 months old South Downs.—Mr. Henry Boys, three 32 months old South Downs.—And William P. Honeywood, Esq., M.P. three 32 months old South Down Wethers.

CLASS XI.—For fat Pigs of any breed, above 4 and under 9 months old.

To the feeder of the best pen of three, Charles N. Pallmer, Esq., M.P. of Norbiton, a premium of 10 gs. for his three 35 weeks old Suffolk and Norfolk Pigs; bred by Mr. P., and fed on barley meal, pollard, and milk.

To the feeder of the 2d best pen of three, Mr. L. Guerrier, of Mile End Road, a premium of 5 gs. for his three 20 weeks old Berkshire Pigs; bred by Mr. G., and fed on barley meal.

The other competitors: Mr. John Hodgson, three 17 weeks old improved Buckinghamshire Pigs.—And Mr. Thory Chapman, three 16 weeks old Hertfordshire and Essex Pigs.

EXTRA STOCK.

OXEN.—Mr. Wm. Walker, two 4 year old Durham Oxen; bred by Mr. Solaway.

SHEEP.—The Marquis of Exeter, 4 Leicester Wethers; bred and fed by his Lordship at Burghley. — Sir Thomas Dyke, Bart., three 20 months old South Downs.—Mr. Edward Pawlett, three 20½ months old South Downs.—Mr. J. Sammons, two 44 months old Leicesters.—And C. C. Western, Esq., M.P. two pure Merino Sheep.

*** Printed forms of the CERTIFICATES, and BILLS of the ANNUAL PREMIUMS, may be obtained on application at the YARD; at PLENTY'S IMPLEMENT FACTORY, Smithfield; at the FARMER'S JOURNAL OFFICE, Budge Row; at MESSRS. THOMAS, Silversmiths, 153, New Bond Street; and by letter, post paid, addressed to MR. WILLIAM FARRY, Secretary, 37, Howland Street, Fitzroy Square.

No. II.

REMARKS on the new and successful MODE of converting TILLAGE LAND to PERMANENT PASTURE of the most fattening quality, in the space of one or two SEASONS; and of renovating inferior PASTURES by the introduction of the more NUTRITIVE GRASSES where they are wanting.

THE results of the numerous and long continued experiments instituted by the Duke of Bedford, at Woburn Abbey, to ascertain the comparative value of the different grasses of which the richest meadows and upland pastures are composed, as to produce, nutritive qualities, early and late growth, and the soils best adapted to bring them to perfection, have induced many eminent and skilful agriculturists in England, Scotland, and Ireland, to attempt that which had never before been effected with success, viz. the renewal of the essential and most valuable permanent pasture grasses on tillage land, in the short space of two seasons, equal in produce and quality to that of an ancient meadow on a soil of the like properties.

These trials, which have been made on almost every kind of soil, and on extensive scales, in some instances exceeding sixty acres on one farm, have proved, in the most satisfactory manner, the certain success of the practice. Several gentlemen, who feel interested in extending the knowledge of this important branch of Practical Husbandry, have thought that it would be useful to submit an outline of the utility and advantages of the new method to those intelligent farmers who may be desirous to renovate and improve inferior grass lands, and to return

land in tillage to superior and productive permanent meadow, in the shortest space of time. Mr. George Sinclair, therefore, who conducted the experiments alluded to, under the directions of the Duke of Bedford, and who, in his "Hortus Gramineus Woburnensis", has given full details of the results of all these experiments, begs to offer the following particulars on this important and interesting subject.

The new practice of forming a rich permanent pasture, in the space of one or two years, is founded on the following facts, relative to the richest and most productive pastures, formed by the hand of nature, in the course of ages. Those pastures most celebrated for fattening, and for dairy produce, consist of from twelve to twenty-six different species of natural grasses and clover, mixed in certain proportons, according to the nature of the soil.

Each of these grasses has a peculiar period, in which it is in greater vigour of growth and perfection than at any other time of the year. From March to November, there is not a month but which has one or more grasses in their highest state of productiveness. The scented Vernal Grass, Meadow-Foxtail, and Smooth Meadow-Grass, give the first and most nutritive bite in March and April; different species succeed these for summer produce; and the Broad-leaved Bent, and Aftermath, or eddish of the Cocksfoot Meadow-Fescue, and others, the richest of the autumn and winter keep.

Thus a constant succession of the richest grass is kept up during the year, on a pasture so constituted, while on a field laid down with one or two grasses, as, for instance, rye grass and clover, there is only a *full* bite during one part of the season. There is an important peculiarity in the natural habits of these grasses; viz. that the individual plants of one kind, species, or sort of grass, cannot be made to grow close to each other, for any length of time, generally not more than for one season; but the individual plants of different species will, and form a dense thick sward, as we find it in the richest natural pastures; but which we look for in vain, in the second year, after the sowing those lands with one or two kinds of grass only; and if the number of different species or sorts be increased to ten, twelve, or more, according to circumstances, the second year from sowing will have produced a sward equal to the richest natural meadow, on a soil of the same nature, for weight of produce, nutritious quality, and permanency. From among the numerous trials which might be quoted, shewing the success of the practice on different kinds of soil, variously situated as to elevation and local climate, the following may be referred to.

Peaty soils, covered with coarse, worthless herbage, may be drained, pared, and burnt, and the proper mixture of grass seeds sown and harrowed in, without the use of the plough*. Light fen soils may be

* Mr. Bell, W. S. Queen Street, Edinburgh, laid down a large extent of this kind of soil, in this manner, without the aid of the plough, with these grass seeds. That gentleman has published an account of the results, and states, that for four years these new pastures have been pastured with a full bite, from the middle of March to the 23d of May; that 348 stones, of 22 lbs. or 3 tons, 8 cwt. and 40 lbs. of hay, per Scotch acre, have each year since sowing, been reaped in 43 days, and the meadows afterwards pastured till the end of November, thus giving 26 weeks' pasture.

successfully returned into permanent pasture, by this mode, after having been for some years in a course of tillage. The present practice is to lay down those lands into pasturage for a considerable term of years, varying in length, according to local circumstances; but, from observations made on the property of his grace the Duke of Bedford, at Thorney, in the Isle of Ely, as well as by the result of one or two experiments which have been tried, it appears that the quality and duration of the herbage upon these fens, may be very greatly improved, by a more judicious and careful selection of seeds with respect to the sorts of grasses to be sown, the cleanliness of the seeds, and the proportions to be observed in mixing the several quantities of each.

On flat lying land, partly alluvial, and partly peaty, which had been supposed could never be returned to rich, valuable pasture, by art, it has been effected in one season, on a farm of Emily, Marchioness of Londonderry, North Cray, Kent, and rendered equal to the richest natural meadows in the neighbourhood*.

Of calcareous gravelly soils, that have been converted into rich productive permanent pasture in the short space of two seasons, may be mentioned that of Mr. Crawley's estate, at Stockwood, in the southern part of Bedfordshire.

Stiff clayey soils, that for the most part are wholly incapable of being brought into a profitable state of pasture, may, by these seeds, and the aid of clean preparation, and judicious manuring, be covered with valuable permanent pasture, and made capable of carrying heavy crops, when once the proper grasses are established. As an instance, we mention that of Mr. Whitehouse's, of Studley, Warwickshire, where an extensive field of the same description, in one season, was formed into a nutritive, productive pasture.

Light sandy and gravelly soils have, where these seeds were employed, with perfect success, turned to improved permanent pasture: among which, occur those of Mr. Stansfeld's, of Wakefield, Yorkshire; Mr. Beaumont Swete's, Oxton, Exeter; the Duke of Bedford's, in Devonshire, under the direction of Mr. Wilson, Manor-house, near Tavistock; on Speedwell farm, Woburn, Bedfordshire, under Mr. Todd; and at Cheynies, Buckinghamshire, directed by Mr. Tween.

On moor and gravelly soils, of high elevation, permanent pasture of superior quality has been formed and improved, where the new practice has been adopted, as on the estates of Mr. Brown, of Auchenlochan, Lismahagow, Lanarkshire; and Lord Ruthven, in Perthshire; and under circumstances extremely unpropitious, the season being hot and dry, and of course very injurious to the seedling grasses.

The above instances are selected, with the view of pointing out the invariable success of the practice, on soils of opposite natures; but equal in importance to the preparation of the soil, and of suiting the proportions of the different kinds of grasses to the nature of it, is the genuine quality of the seeds, for where they are not good, or only partially so, the result will be very unsatisfactory, if not altogether a failure.

Enquiries on the subject will be promptly answered, and orders

* Mr. Legget, the steward on the estate, will, with pleasure, point out this meadow to any gentleman who may be desirous of witnessing this improvement.

executed to any extent, by addressing letters to Messrs. Cormack, Son, and Sinclair, Seedsmen, New Cross, near London; where may be seen an arrangement of all the different grasses cultivated separately, exhibiting in one view their various and valuable habits of growth above alluded to.

No. III.

FARM ACCOUNTS.

The advantages of clear accounts are obvious in every other pursuit of life: yet, strange as it may appear, the making of a few rough memoranda or figures, to yield a *gross* account of the general receipts and expenditures, usually constitutes the utmost efforts which are made by the majority of farmers who profess to keep accounts. Not unfrequently do men engage in agriculture, without much previous education, or even study and inquiry; and they conduct large concerns in it, without those accounts which are justly reckoned essential in every other business. To this unaccountable omission may be traced much of that uncertainty as to the real state of their affairs, with which industrious farmers are often perplexed, as well as of that loss which they often sustain. In order to supply this very material deficiency, the following outline of a Farming Account Book* is offered to the attention of farmers and graziers:—

JOURNAL from

State of Weather.

		Barom.	Therm.	Wind.	Rain.	
Mon.						
Tues.						
Wed.						
Thurs.						
Friday.						
Satur.						

* A very Complete Farmer's Account Book, published by Messrs. Swinborne, Walter, and Taylor, of Colchester, may be procured of the publishers of this work, or of any bookseller, in folio, price 10*s.* 6*d.* half-bound.

WEEKLY STATE of LABOUR, &c. from

Names of Men and Horses.		Monday.	Tuesday.	Wednesd.	Thursday.	Friday.	Saturday.	No. of Days	Per Day.	£. s. d.
	Farm Servants.									
	Daily Labrs.									
	Horses.									
	Task Work.									

Weekly State of Cash.

			Dr.			Cr.		
			£	s.	d.	£	s.	d.
Weekly State of Grain, Sale of Cattle, with other Occurrences.								

TABLE to cast up Wages, by the Day, Week, Month, and Year.

By the Day.		By the Week.			By the Month.			By the Year.		
s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
0	1	0	0	7	0	2	4	1	10	5
0	2	0	1	2	0	4	8	3	0	10
0	3	0	1	9	0	7	0	4	11	3
0	4	0	2	4	0	9	4	6	1	8
0	5	0	2	11	0	11	8	7	12	1
0	6	0	3	6	0	14	0	9	2	6
0	7	0	4	1	0	16	4	10	12	11
0	8	0	4	8	0	18	8	12	3	4
0	9	0	5	3	1	1	0	13	13	9
0	10	0	5	10	1	3	4	15	4	2
0	11	0	6	5	1	5	8	16	14	7
1	0	0	7	0	1	8	0	18	5	0
2	0	0	14	0	2	16	0	36	10	0
3	0	1	1	0	4	4	0	54	15	0
4	0	1	8	0	5	12	0	73	0	0
5	0	1	15	0	7	0	0	91	5	0
6	0	2	2	0	8	8	0	109	10	0
7	0	2	9	0	9	16	0	127	15	0
8	0	2	16	0	11	4	0	146	0	0
9	0	3	3	0	12	12	0	164	5	0
10	0	3	10	0	14	0	0	182	10	0
11	0	3	17	0	15	8	0	200	15	0
12	0	4	4	0	16	16	0	219	0	0
13	0	4	11	0	18	4	0	237	5	0
14	0	4	18	0	19	12	0	255	10	0
15	0	5	5	0	21	0	0	273	15	0
16	0	5	12	0	22	8	0	291	4	0
17	0	5	19	0	23	16	0	310	5	0
18	0	6	6	0	25	4	0	328	10	0
19	0	6	13	0	26	12	0	346	15	0
20	0	7	0	0	28	0	0	365	0	0

A TABLE

For CALCULATING the EXPENSE of DIBBLING, HOEING, SOWING, REAPING, MOWING, &c. &c. by 10, 15, 20, 30 Poles, the Rood, and Acre, from Two Shillings to Two Pounds; cast up to the Fraction of a Farthing.

Total Sum per Acre.			Ten Perches or Poles.	Fifteen Poles.	Twenty Poles.	Thirty Poles.	Rood.	Acre.
£	s.	d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.
at 0	2	0	0 1¼,000	0 2½,000	0 3 ,000	0 4½,000	0 6	0 2 0
0	2	6	0 1½,500	0 2¾, 25	0 3¾,000	0 5¼,500	0 7½	0 2 6
0	3	0	0 2¼,000	0 3½,500	0 4½,000	0 6¾,000	0 9	0 3 0
0	3	6	0 2½,500	0 3¾,750	0 5¼,000	0 7¾,500	0 10½	0 3 6
0	4	0	0 3 ,000	0 4½,000	0 6 ,000	0 9 ,000	1 0	0 4 0
0	4	6	0 3¼,500	0 5 ,250	0 6¾,000	0 10 ,500	1 1½	0 4 6
0	5	0	0 3¾,000	0 5½,500	0 7½,000	0 11¼,000	1 3	0 5 0
0	5	6	0 4 ,500	0 6 ,750	0 8¼,000	1 0¾,500	1 4½	0 5 6
0	6	0	0 4½,000	0 6¾,000	0 9 ,000	1 1½,000	1 6	0 6 0
0	6	6	0 4¾,500	0 7¼,250	0 9¾,000	1 2¼,500	1 7½	0 6 6
0	7	0	0 5¼,000	0 7½,500	0 10½,000	1 3¾,000	1 9	0 7 0
0	7	6	0 5½,500	0 8¼,750	0 11¼,000	1 4¾,500	1 10½	0 7 6
0	8	0	0 6 ,000	0 9 ,000	1 0 ,000	1 6 ,000	2 0	0 8 0
0	8	6	0 6¼,500	0 9½,250	1 0¾,000	1 7 ,500	2 1½	0 8 6
0	9	0	0 6½,000	0 10 ,500	1 1½,000	1 8¼,000	2 3	0 9 0
0	9	6	0 7 ,500	0 10½,750	1 2¼,000	1 9¾,500	2 4½	0 9 6
0	10	0	0 7½,000	0 11¼,000	1 3 ,000	1 10½,000	2 6	0 10 0
0	15	0	0 11¼,000	1 4¾,500	1 10½,000	2 9¾,000	3 9	0 15 0
1	0	0	1 3 ,000	1 10½,000	2 6 ,000	3 9 ,000	5 0	1 0 0
1	5	0	1 6¼,500	2 4¾,250	3 1½,000	4 8¼,000	6 3	1 5 0
1	10	0	1 10½,000	2 9¾,000	3 9 ,000	5 7½,000	7 6	1 10 0
1	15	0	2 2¼,000	3 3½,500	4 4½,000	6 6¾,000	8 9	1 15 0
2	0	0	2 6	3 9 ,000	5 0 ,000	7 6 ,000	10 0	2 0 0

No. IV.

MONTHLY CALENDAR

OF WORK TO BE DONE THROUGHOUT THE YEAR.

OCTOBER *.

Hire and stock farms. Insure property without delay. Hire servants †. Sow winter tares. Dig and plough up root crops. Manure grass lands. Sow rye. Lay up fallows. Manure and plough for pease, beans, barley, and oats. Scour out drains, ditches, and other watercourses. Collect and convey decayed and fallen leaves to the yards, that they may be saturated with urine for manure. Water the meadows. Get the straw-yards, cow-houses, and stables ready for the cattle, as this is the last month of their continuing abroad. Put fatting beasts to cabbages, carrots, or turnips; cows in milk to cabbages, in a separate yard; dry cows to chaff; and the teams to chaff, hay, mixed fodder, or other dry food. Fatten swine. Put rams to ewes. Destroy weeds. Plant quicksets. October, it should be remarked, is one of the busiest seasons in the whole year; and comprises that period of good or tolerable weather which usually takes place before most field business is stopped by rain, snow, or frost; hence it may not unfrequently happen, that work, here minuted as requiring to be done, must be finished in the following month. Whatever business, therefore, the farmer cannot execute in October, he must finish as soon as he can in November.

NOVEMBER.

Finish ploughing fallows. Continue watering the meadows. Dig and cart manures. Destroy ant and mole hills, and level pastures. Repair fences, and continue to scour out ditches. Hollow-drain wet lands. Cut down wood. Buy in store-pigs for the yard, and put up bacon hogs to fatten. Kill fat beasts, and swine already fattened off for curing bacon. Select young calves to breed from. Steam roots. Keep fatting sheep on turnips or cabbages, and lean ones on the remnant of summer grass, and on sheep-walks. Stack and preserve carrots, if not already done, and turnips from frost.

* As the farmer's year, from custom, and in most instances from convenience, almost generally commences from Michaelmas, the present Calendar has been drawn up with reference to that circumstance.

† As in many instances farmers do not give characters, and it is not always easy to form a quick and correct judgement of the accounts given by individuals who want situations, it has been suggested, with a view to obviate this difficulty, that farmers might have among themselves only, printed circulating letters, requiring merely their signature, and containing the moral character of the servant: his skill in business, careful or slovenly mode of doing it, length of time he has been employed, age, constitution, and other requisite information.

DECEMBER.

As bad weather usually sets in this month (if not before), farmers should keep a strict watch for fine open weather, to do all the out-door work remaining unfinished. Carefully tend the farm-yards, cow-houses, stables, and cattle-sheds. Pare and burn old ley-grounds. Moss-harrow and level pastures and meadows. Attend particularly to ewes, near the time of lambing. Occasionally give fat sheep some hay. Well litter swine. As at this season the teams are generally unemployed, let every opportunity offered by open weather be diligently employed in repairing fences, cleansing drains, ditches, &c. Continue to water the meadows. Sell house-lambs. Put boars to sows for spring litters. Sell poultry. Finish ploughing for spring crops, left undone in October or November. Settle farm accounts.

JANUARY.

Carefully watch cows, near the time of calving. Put ewes that have already lambed, or are near the time of lambing, into rouen. Fatten beasts. Marl lands. Repair fences and hedges, by ploughing or otherwise. Drain wet lands. Sow pease and beans. Examine water furrows and water meadows. House weanling calves and foals. Cut and spread ant-hills. Finish killing and curing bacon, if not already done. Burn lime.

FEBRUARY.

Plough such lands as are sufficiently dry, for the earliest crops. Sow furze. Sow beans and pease. Sow cabbages, rye, oats. Continue to repair hedges. Lay up meadows and pastures about Candlemas. Manure grass-lands. Attend to ewes lambing. Water meadows. Sow parsnips and saintfoin. Sell off fat beasts. Sell fat lambs, and fatten ewes on clover.

MARCH.

Turn sheep into old watered meadows. Shut up meadows and pastures for grass crops. Watch cows near calving, and ewes near lambing. Turn out calves dropped the preceding month among the fatting beasts. Geld lambs. Finish sowing beans, pease, and oats, left unsown. Watch sows about to farrow, especially young ones. Buy lean beasts, to fatten for winter consumption. Soil cattle. Dispose of fat beasts, and wethers fattened in winter. Repair hedges. Sow parsnips. Sow tares, white beet, turnip cabbage, spring rye, and oats; pease, potatoes, saintfoin, and lucerne. Sow carrots, furze, and cichory. Feed new lays. About the end of this month, sow the common clover. Brew beer. Kill no bacon hogs after this month. Pick stones off the land. Settle farm accounts.

APRIL.

Early this month, finish sowing oats and tares. Sow buckwheat, furze, lucerne, saintfoin, rye-grass, clovers, and hay seeds. Attend to cows calving, and ewes lambing. Castrate lambs and pigs. Soil

cattle. Sell fat stock. Put mares to stallions. Turn cattle into pastures. Put sheep into water-meadows. Attend to mares foaling. Destroy ant-hills and mole-hills. Hoe potatoes and carrots. Finish repairing fences. Sow burnet.

MAY.

Put bulls to cows, and boars to sows. Wean young pigs of the first litter. Finish sowing buckwheat. Sow burnet, lucerne, saintfoin, oats, turnips for winter use. Watch mares foaling. Early this month, cross-harrow fallows. Hoe early planted potatoes, and plant out potatoes for winter consumption. Turn cattle into pastures. Graze pastures laid to rest at Candlemas, and shut up such as are to be fed off at Midsummer. Bleed horned cattle, if needful. Purchase wethers (two or three shear), to be fattened off during winter months. Pare and burn. Water meadows. Destroy moles and other vermin. Drain swampy and boggy land. Cut, dry, and house turf for winter fuel. Mow tares and lucerne.

JUNE.

Put bulls to cows. Sow turnips. Attend to the cabbage crops. Dig fossile manures. Wean lambs. Shear sheep. Dispose of fat stock. Soil cattle. Clean out ponds, and prepare the mud for manure. Pare and burn. Mow grass lands. Make hay. Mow rye-grass and saintfoin. Continue to get in turf for winter fuel. Settle farm accounts.

JULY.

Put bulls to cows. Finish the weaning of lambs. Sow burnet. Shear sheep, if the month of June has been too wet or cool. Hand-hoe turnips already planted. Sow cole-seed. Weed cabbages, and hoe those planted in June, early in this month. Hoe carrots and parsnips. Finish mowing grass lands. Mow lucerne. Finish hay-making. Hoe lucerne. Fold sheep. Cut early pease. Pare and burn. Continue clearing out ponds, and prepare the mud for manure. Reap early rye about the end of this month. Plough fallows. Shut up rowen.

AUGUST.

Reap and mow every kind of grain and pulse as they ripen. Sow rape, turnips, vetches, and burnet for winter use. Set the flocks, and sell off fat sheep. Watch sows (particularly young ones), near the time of farrowing. Sow grass seeds. Transplant lucerne. Weed potatoes by the hand, if the horse-hoe cannot reach them. Sow cabbage seed for plants to be transplanted in the following April. Cut lucerne. Turn sheep into saintfoin cut in June. Sell spare lambs. Lay down lands to grass.

SEPTEMBER.

Sell off spare fat stock. Put rams to ewes, for early lambs. Geld pigs farrowed in August. Wean and castrate foals. Purchase half-

fed sheep and beasts for winter fattening. Manure grass lands. Scarify grass lands. Turn cows and fatting beasts into saintfoin rowen. Sow winter tares and winter rye. Turn out swine to pick up acorns, and put up bacon hogs to fatten. Keep cattle out of lands newly laid down to grass. Examine accounts.

No. V.

OBSERVATIONS ON THE WEATHER.

Among the various phenomena which attentive observers have found to indicate approaching changes in the atmosphere, the following may be selected as affording the most certain signs.

I. *By animals.*—Previous to rain and wind, or stormy weather, neat cattle and sheep seem more than usually desirous of feeding in their pastures, and to leave them with reluctance. A similar change is announced by the uneasiness of swine, which grunt loudly, and retire to their styes; by geese and ducks washing themselves repeatedly and with little intermission, flying anxiously backwards and forwards; by swallows flying low and skimming along the surface of the water, twittering with more loudness than usual; and by poultry rolling much in dust and sand, or gravel. Wet and windy weather is likewise indicated by dogs becoming drowsy and stupid, and exhibiting an evident reluctance for food, except grass (particularly the species denominated dog's grass, or couch-grass); and by cats losing their vivacity, and remaining within doors. Continued rain is announced by pigeons returning slowly to their cotes; a change from cloudy or unsettled to greater wet, by flies stinging and swarming more than usual; and a sudden variation, accompanied with a storm, by wild ducks, plovers, bustards, and other aquatic birds withdrawing to the sea-coast, or to the marshes.

The contrary circumstances evince the longer or shorter continuance of fine weather; to which may be added, that bees flying abroad, and labouring with that industry which has become proverbial; crows croaking in the morning; the robin or red-breast singing early from the more elevated branches of trees; and gnats flying in a columnar form, within the rays of the setting sun, are all indications of fine or serene weather.

II. *From the appearance of the earth.*—Thus moist stones and dry soil prognosticate rain; a continued fall of which may be expected, if the ground seem nearly dry, and the roads almost, if not wholly free from mud; as the contrary occurrences announce that the evaporation of humidity has ceased, and consequently that fine weather is approaching.

III. *From the atmosphere.*—If in the evening a white mist be spread over a meadow contiguous to a river, and be evaporated by the sun's rays on the following morning, it is an indication of fine weather throughout the day; so in the morning, if a mist, which is impending

over low lands, draw off towards those which are more elevated, it announces a fine day. The gradual diminution of clouds till they can no longer be seen in the air, is a sign of fine weather; so likewise is the continuance of abundant dew upon the grass after a serene day. The contrary events announce a change of weather, which may be more clearly known by the clouds gathering and lowering; by the sky, after serene weather, becoming undulated as it were with small clouds. During winter, if the clouds appear not unlike fleeces, i. e. thick and close in the middle, and very white at the edges, the surrounding sky being remarkably blue, they indicate hail or snow, or cold, chilling showers of rain. Further, where the clouds appear moving in two opposite currents, and the lower current is wafted rapidly before the wind, it is a certain sign of rain; and if they occur during summer, or generally in hot weather, they announce thunderstorms. If the rays of the sun break through the clouds, and are visibly dazzling in the air, the latter is loaded with vapours that will speedily descend in showers of rain. Thunder is mostly preceded by hot, and followed by cold and drizzling, or showery weather. Frequent variations of the wind to the different points of the compass, evince the speedy approach of rain, particularly if it whistle or howl in its course through the atmosphere. The west wind is usually damp, on account of the vast quantity of vapour it collects in its progress over the Atlantic Ocean; the south wind, which blows from the torrid zone, is the warmest of the four; as the north wind is the coldest; while the east wind is the most dry; but if rain fall during the prevalence of an easterly wind, it may be expected to continue, with little intermission, for four and twenty hours.

IV. *From the seasons.*—1. A moist autumn, followed by a mild winter, is usually succeeded by a dry and cold spring, in consequence of which vegetation is materially retarded: such a spring occurred in 1741.

2. Should the summer be unusually cold and wet, the ensuing winter may be expected to be extremely cold; for the heat or warmth of the ground will be dissipated or carried off, in consequence of such unusual evaporation.

3. Very wet summers are mostly attended with an increased quantity of seed on the dog-rose and white-thorn bushes; so that the uncommon fruitfulness of these shrubs may be regarded as a certain indication of an intensely cold winter.

4. A severe winter is uniformly predicted by cranes and other birds of passage migrating early in autumn; for these creatures never take their flight southwards until the cold season has commenced in the northern regions.

5. Should frequent showers fall in September, it seldom rains in May; and the reverse. So there usually falls less rain in April than in October, in the proportion of one to two; in March than in November, in the proportion of seven to twelve.

6. On the contrary, should the wind blow from the south-west, during either summer or autumn, and the air be uncommonly cold for those seasons, a profuse fall of rain may be speedily expected.

7. A kind of crisis takes place in the atmosphere after great storms,

rains, or similar violent commotions of the clouds, so that they are for some months attended with a regular succession either of bad or of fair weather.

Lastly, a cold and rough autumn prognosticates an intense winter; as the latter season, when rainy, is mostly succeeded by an unproductive year.

For the preceding remarks we are chiefly indebted to an interesting tract (which in fact every farmer should possess), entitled "The Farmer's and Gardener's Directory, containing the most approved Rules and Directions for foretelling the Changes which take place in the Weather, &c." We shall conclude these hints respecting the atmosphere with the following rules laid down by Mr. Kirwan, from observations which had been made in England, during a period of 112 years, from A. D. 1677 to 1789 *.

1. When no storm has either preceded or followed the vernal equinox, the ensuing summer is in general dry, or at least so five times out of six.

2. If a storm happen from an easterly point on the 19th, 20th, or 21st day of May, the succeeding summer will also be dry four times in five. A dry summer will likewise follow, if a storm arise in any point of the compass on the 25th, 26th, or 27th days of March.

3. Should there be a storm, either at south-west or west-south-west, on any day from the 19th to the 21st of March, the ensuing summer will be wet five times out of six.

In England, if the springs and winters be dry, they are generally cold; but if moist or humid, they are usually warm; whereas dry summers and autumns are mostly hot; so, on the contrary, moist summers are cold. Thus, if the moisture or dryness of a particular season be ascertained, an idea may be formed with tolerable precision respecting its temperature, and the farmer, by attending to the various indications of the weather, will be enabled to provide accordingly for the exigencies of his cattle stock.

* Transactions of the Royal Irish Academy, Vol. V.

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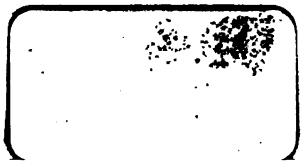
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